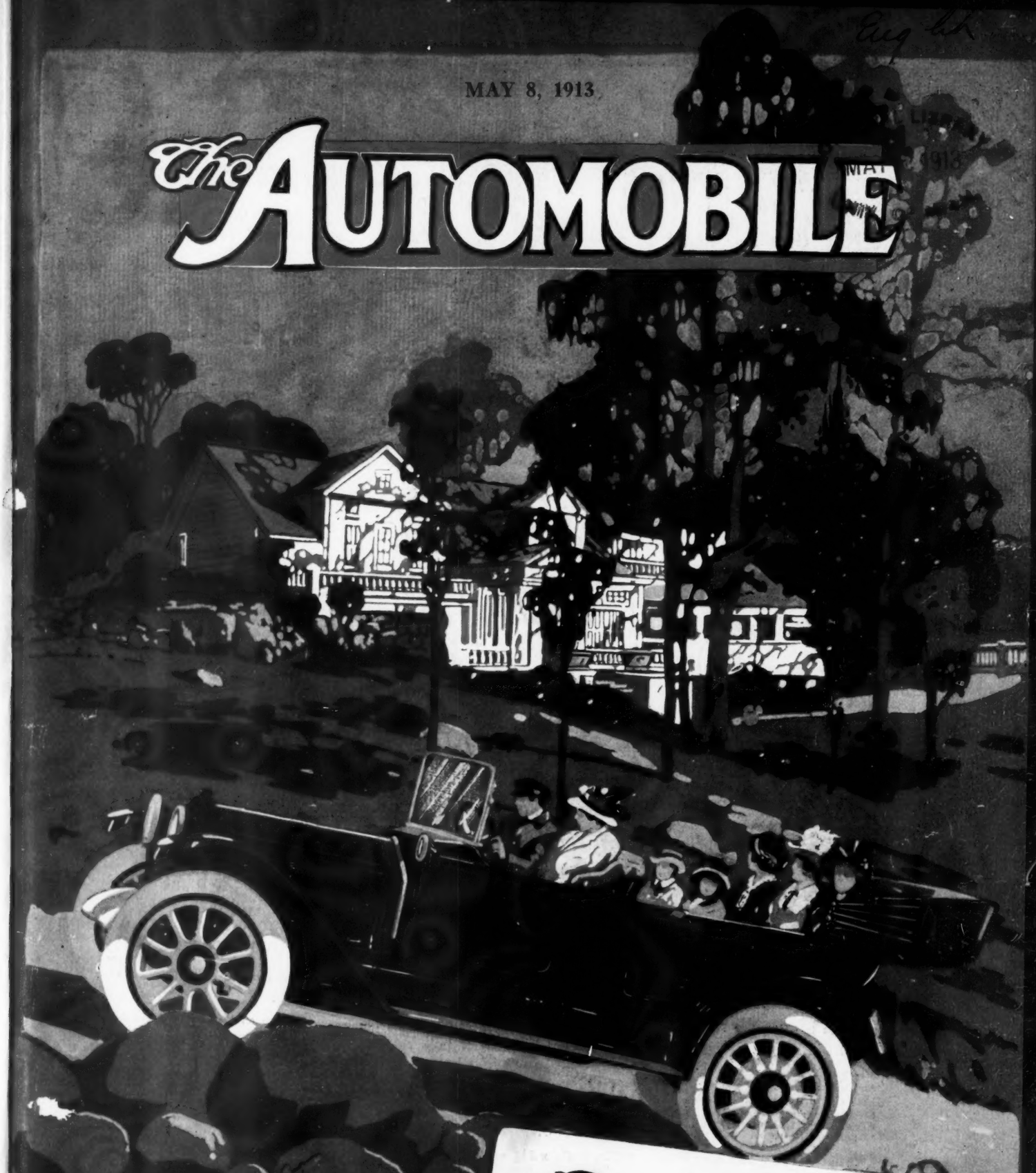
MAY 8, 1913

# The AUTOMOBILE





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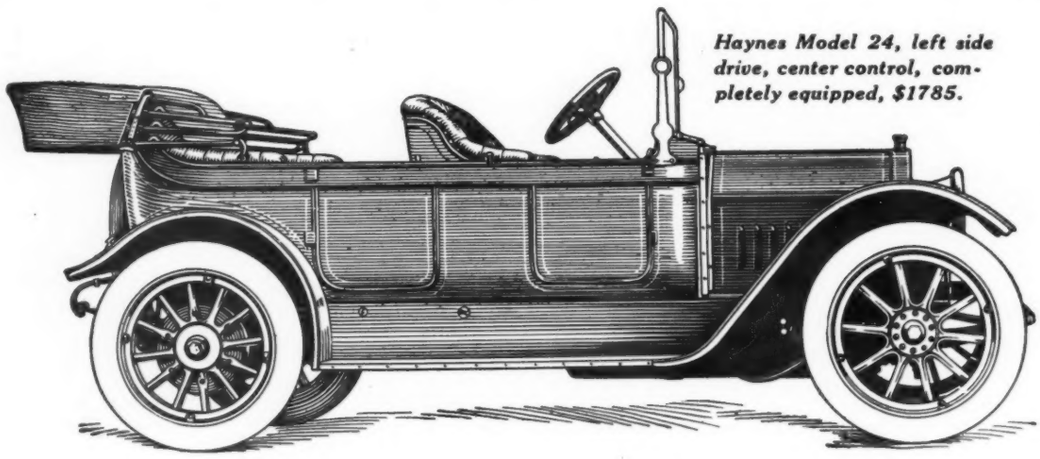


*Haynes Model 24, left side drive, center control, completely equipped, $1785.*

# *Always a Leader— Now More Than Ever*

# HAYNES

## *A New Model at New Low Price*

HAYNES Model 24—a big, roomy five-passenger touring car—brings a new standard of value into the $1800 field.

This Haynes for $1785 is a *rare car.*

Keep in mind the fact that here is a *known* make, *not* an unknown or a *new make.* Remember that Haynes history and Haynes success reach clear back to the *very beginning* of American motordom. Remember that in twenty years Haynes has never marketed an experiment or an over-priced car. Take note of these things and you will begin to appreciate the value of this new model.

***In the whole $1800 class we do not believe there is any other car that measures up to this new Haynes Model 24, in design, materials, equipment, the sincerity which is built into it.***

Model 24 is *big enough* for a good-sized family, so *strong* that it is ideal for touring, so *stylish* as to please really *critical* folk, and *fast enough* for anybody. It is roomy both front and rear. Its power is all you could ask for. And it's so *quiet* we might well call it silent.

An interesting car, mechanically!

Left side drive, center control.

Electrically started and lighted, by the Leece-Neville most efficient separate unit system, the type of equipment first adopted by Haynes and now recognized as the standard type.

Four cylinders, 4¼-inch bore, 5½-inch stroke, cast in pairs. Wheelbase, 118 inches.

34 x 4-inch tires.

Big brakes, 14-in. x 2½-in.

Notable regular equipment, including, besides the electric starting and lighting system, top, top cover, two large electric headlights, glass front, electric side lights flush in dash, electric tail light, electric cowl lamp, Eiseman dual magneto, speedometer, extra demountable rim, horn, coat and foot rails, tire irons, tools, etc.

***The new Haynes "Six," 4¼ x 5½ motor, 130-inch wheelbase, $2500.***

**When you are selecting a new line, why not pick a certainty?**

## HAYNES AUTOMOBILE COMPANY

**503 Union Street** **Kokomo, Indiana**

VOL. XXVIII NEW YORK—THURSDAY, MAY 8, 1913—CHICAGO No. 19

The AUTOMOBILE

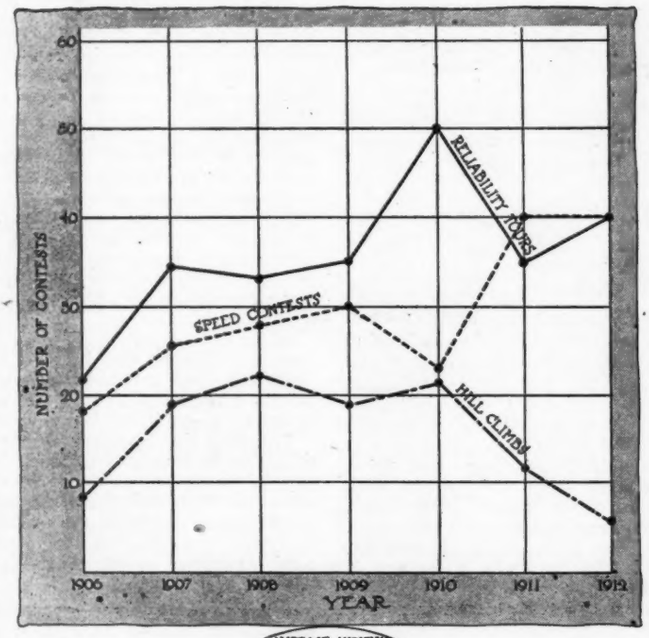
# Makers Want Stock Car Contests

## Find That the Performances of Specially-Constructed Machines, While Most Interesting from the Spectacular Viewpoint, Are of Little Practical Value to Either the Manufacturer or Buyer

SPEED has had a strange fascination on mankind ever since the history of the world began. Two thousand years ago chariot races attracted the Roman crowds to the circuses. Nowadays it is the automobile. The charioteer who held the reins in those early days and goaded his horses to victory now holds a driving wheel and coaxes a carbureter. Now conditions are different.

Today business has to be reckoned with; the advertising man of today has stepped in at such a splendid opportunity for a full-page display in animation and all the colors of nature before a huge and intensely interested audience. The cars were labelled and the money spent in entering the contests found to be a sound advertising investment. That is, it was until the entered cars bore so little resemblance to the product which the name represented that public interest in that side of the game waned. The prospective automobilist who wished to gain some idea of the relative capabilities of the various makes by following speed trials soon found that there were so many special features incorporated and stock features omitted in the cars raced that the name meant little or nothing. This is not to say that the contests themselves were any the less attractive from the spectacular point of view; rather the reverse, for the speeds attained were, of course, much higher. But there was a very evident decline in the commercial value of automobile racing.

This state of affairs brought about the framing of the stock-car rules a few years ago, so that automobile contests may be divided into two broad classes, the free-for-all and the so-called stock race. The first of these divisions, by its nature is easy and definite. It is the second classification with its elasticity and lack of definition, around which there has been so much contention and dissatisfaction.



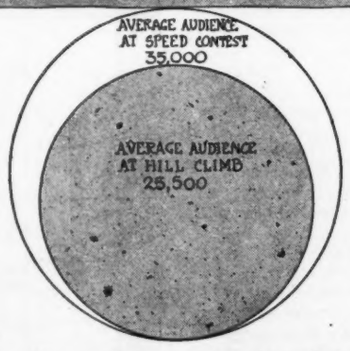




**Fig. 1—Total number of speed contests, reliability tours and hill climbs since 1905, showing the trend in popularity. Fig. 2—Average audience at speed contests and hill climbs, respectively**

Stock cars which were only such before they underwent extensive alteration calculated to bring them into a good position at the finishing line were entered in stock-car events. And the manufacturer who saw that another competitor's machine had undergone more alteration than seemed to him justifiable for such a race naturally felt that the conditions were unfair and the results not only valueless, but such as to detract seriously from the standing of his own product in the open field.

The difficulty of forming rules to govern stock car events is clearly indicated in the present A. A. A. contest rules, in which it is stated that:

It shall be the duty of the Technical Committee of the Contest Board to pass upon, establish and certify to the Contest Board the stock status of all manufacturers' models offered for registration with the Contest Board as stock cars and stock chassis.

In any case where it may be necessary to establish the status of any car alleged to be a stock car under the definition contained in these rules, the committee shall have the right

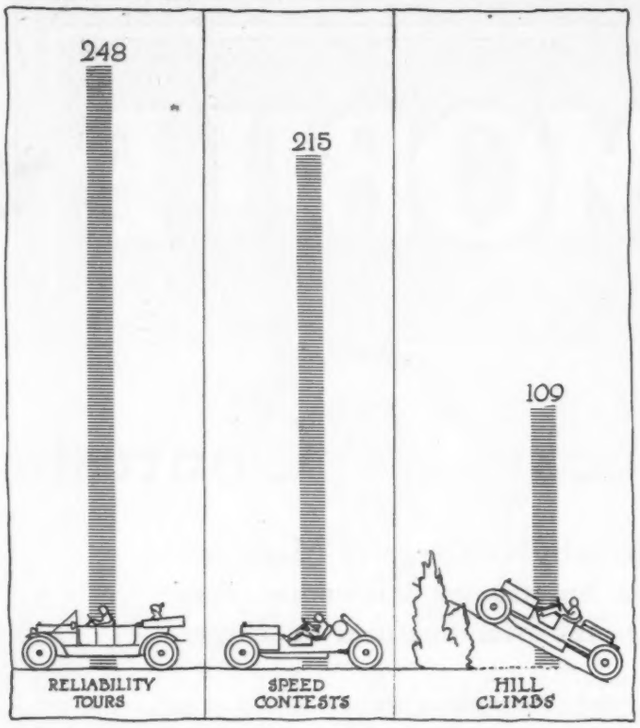



Fig. 3—Graphic representation of the total number of reliability runs, speed contests and hill climbs from 1906 to 1912, inclusive

to visit the factory of the manufacturer of such car, who shall be required to submit to the committee such evidence as it may require to verify the allegation on which the "stock" status of the car is based.

For some reason or other the manufacturers seem to have fought shy of registering with the Contest Board. Possibly the rules appear more stringent than is necessary.

The question of speed contests, reliability tours and hill-climbs is receiving a great deal of attention at the present moment, and in view of this fact the following opinions bearing on the comparative values, both from the commercial and spectacular points of view of stock-car and free-for-all contests is of great interest, coming, as they do, from makers who have been prominent supporters of contests in the past.

H. Butt, of the Mercer Automobile Co., believes that "if a commission could be formed to control stock car contests with powers to rigidly inspect all entrants and to reject all that were not abiding strictly by the rules, such inspection to go to an extent of an analysis of metals employed, providing the commission, in its judgment thought such drastic action necessary, it would be possible to hold stock car races on which the buying public could safely base its estimate of the cars engaged. Free-for-all contests are instructive to the manufacturer and indirectly benefit the public by developing weakness of construction, but are of little value to the prospective owner of an automobile when endeavoring to decide upon the type of car he wishes to buy. We are strongly in favor of stock car contests, and believe they are far more important to the industry than are the more spectacular races."

In the opinion of E. W. Bennett, of the Willys-Overland Co., which does not make racing cars, "automobile contests have outlived their usefulness and there has been so much elasticity in the rules of both special and stock contests and in reliability and other runs that they have ceased to interest the public."

That considerable help to the engineer can be derived from contests of any kind is the opinion of E. LeRoy Pelletier, of the Maxwell Motor Co., who says: "In the development of gas-engine chassis design, doubtless there is considerable value to engineers in these contests—even between extremely light stripped special racing machines. The engineer is able to make valuable deductions from these, but they are of value only to the engineer. As far as the public is really concerned with them, they are meaningless. This has been proven over and over again, from the fact that cars which have won the biggest free-for-all events have sometimes proven the greatest failures commercially and in the hands of users.

Webb Jay, of the Haynes company, "feels that unless the rules for stock cars were more clearly defined, the free-for-all race carries more value than what is termed stock car events and is certainly a great deal more attractive, and the number whose attention is attracted to these contests, as a rule, determines the advertising value."

Homer McKee, of the Cole Motor Car Co., divides automobile contests into two classes, namely, utility contests and sport contests, and says: "From a utilitarian standpoint, there is no question that the contest most worth while is the strictly stock car event. From a sport standpoint, it is equally evident that the free-for-all event offers vastly more opportunity. Personally, it appears to me that the public's general support of stock car events, while in some way increasing the efficiency of the average motor car product, would, on the other hand, work a decided disadvantage in races by inducing manufacturers to attempt to build cars with speed in mind rather than general endurance. There would be an inducement to use higher gear ratios than would be practicable for every-day usage on the country roads, and in the case of hill-climbs the tendency would also be to install gear ratios that would not be best for general road conditions. In other words, the type of motor car naturally evolved by general support of stock car contests would be over-developed in order to arrive at efficiency in the particular direction which the respective events would be intended to bring out. General endurance contests tending to prove the average efficiency of the average car are undoubtedly good. It should, however, be borne in mind that in all stock car events the main attempt should be to develop a better average car for the ordinary user. If hill-climbs and races in which only stock cars participate tend to this conclusion, such events are undoubtedly good."

### Speed Contests Aid Designers

That the strictly speed contest is of great value to the designer by developing details that can be introduced advantageously in the stock product is the opinion of V. A. Longaker, of the American Motors Co., who states: "If stock cars only were to be used in speed contests, no manufacturer could place upon a track any new creation and get any benefit whatever from its performance. Instead of stock car principles being reconstructed for speed contests, cars should be designed strictly for speed and then modified and incorporated in the program of the manufacturer. If real stock cars were raced, it would be a help and might prove something to the buying public, who are the only ones interested in the matter of stock car competition. But it is well known that no stock car, strictly speaking, has ever been entered in a speed contest of note. Special material, special fits, special carbureters, special magnetos and various other things are incorporated into these cars and the word stock is therefore a misnomer."

Alvan Macauly, of the Packard Motor Car Co., does not favor contests generally, but believes that "the ideal contest should be limited to stock cars and run under the usual conditions of automobile usage, so as to wear out all except those cars best adapted to meet the conditions."

Although the National Motor Vehicle Co. retired from participation in contests at the close of the Indianapolis Speedway race of last year, it is still strongly in favor of stock car contests. G. M. Dickson, of that concern, writes: "We believe the present stock car rules are sufficiently concise to insure fair and honorable contests, if it were possible to maintain a salaried technical committee to enforce these rules to the letter, and if there

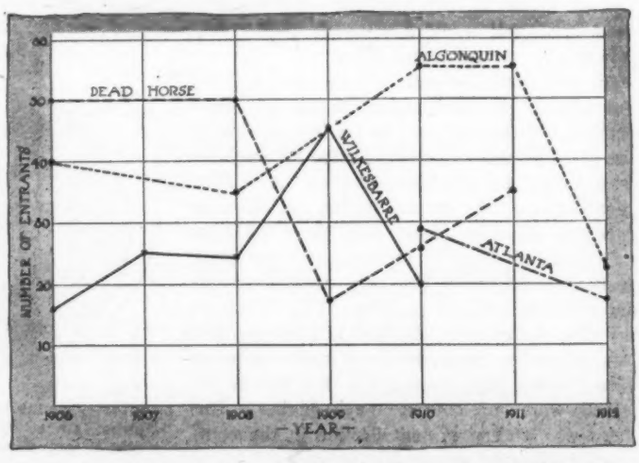



Fig. 4—Chart showing the number of entrants in America's four leading hill climbs, covering the 7 years from 1905 to 1912

is a feeling on the part of American manufacturers that stock car contests should be revived, we would be in favor of heartily supporting such a movement."

It is the opinion of the Henderson Motor Car Co. that all reliability or economy road contests should be limited to stock cars. C. P. Henderson, of that company states: "At one time we thought this should be the rule governing all racing contests, but we have since come to think that the public is more interested in speed than stock requirements, when it comes to a regular speedway event. It would therefore seem that free-for-all events should be encouraged on the speedway.

Chas. F. Barret, of the Knox Automobile Co. points out that the two chief purposes of entering competition of the kind in question are: "first, to make a thorough road test under official auspices of new models so as to correct any weakness which might develop, and second, to impress upon the automobile buying public the reliability and other desirable qualities which standard models could give." On the question of the relative value of racing stock and special cars Mr. Barret continues: "It has never seemed fair to us, or, in fact any help to the industry as a whole, to put specially built cars into contests of this sort, when the automobile public itself knows very well that no matter how well a car may perform under the requirements, they would never secure a car like it from the manufacturer for their personal use. In certain types of racing contests which are run largely for amusement it seems entirely consistent to use specially built models but in contests that are calculated to prove the actual ability of existing types of cars to negotiate certain road conditions, it is nothing short of a humbug to use any other than stock models."

**Indications for the Future**

The present month is the beginning of another racing season, and the time when those interested in the sport ask whether the prospects are as bright as in previous years or whether a decline in automobile speed contests is imminent. If the list of entries in the famous 500-mile struggle to be held at Indianapolis at the end of this month is any criterion, the followers of automobile sport are in for a good time. But this does not answer the question as to which direction motor racing is moving. The fact is that those who look pessimistically at this matter are inclined to base their views on the decline in popularity of particular events without considering the whole trend throughout the contest field.

With the idea of showing more definitely how the sport really stands the charts accompanying this article have been prepared. They represent graphically the varying popularity of the three principal kinds of automobile contests covering a period of the last 7 years. The diversions referred to are: speed contests, whether on road or track; reliability trials, including economy and endurance runs, and hill-climbs.

Fig. 1 shows by the number of important American contests held each year since 1906 the trend of public favor in reliability tours, speed contests and hill-climbs. It will be seen that with the single exception of 1911, when the speed events exceeded in number the reliability trials, the latter form of contest takes the lead, and, moreover, that the tendency of the curve as a whole

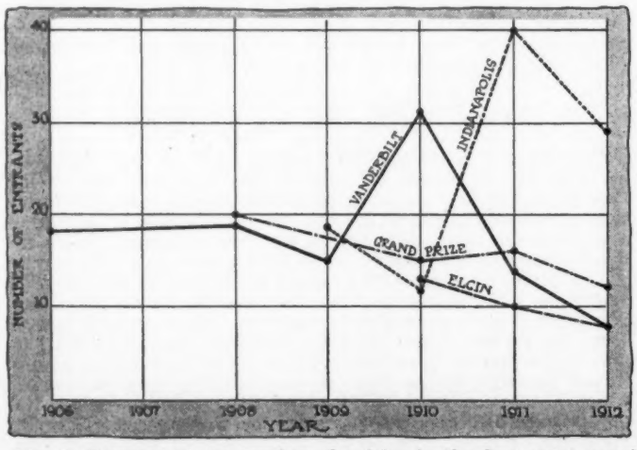



**Fig. 6—Diagram of the number of entries in the four great speed classics of the United States during the past 7 years**

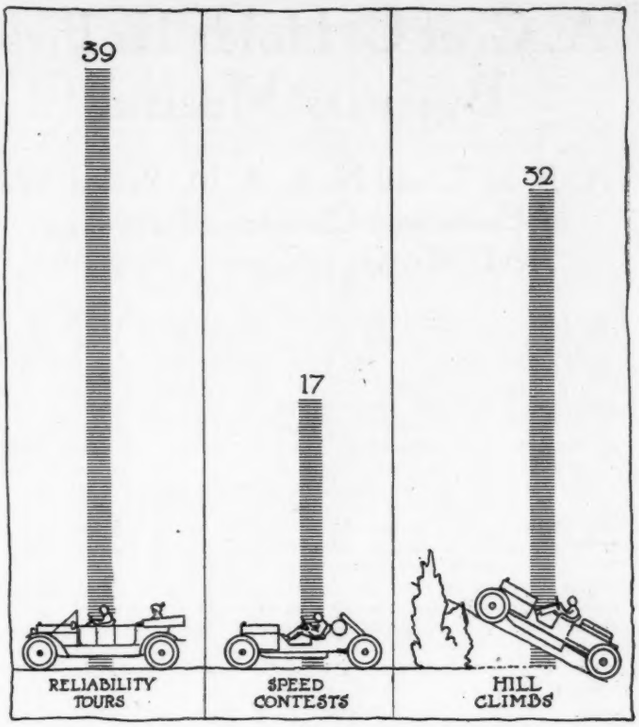



**Fig. 5—Comparison of the average number of entries in the three great divisions of automobile contests since 1905**

is favorable to increased interest in the future. The same can be said of the line which denotes the popularity of the purely speed contest. Although record speed achievements are now being made only on small margins there have been a sufficient number of these during the last year, or even the last few months, to warrant a keen public interest in any new car which is at all likely to go one better than the previous best in the way of making records.

The total number of events in the three divisions during the past 7 years shows the reliabilities lead with 248, as against 215 speed races and 109 hill-climbs, as charted in Fig. 3.

The hill-climb seems to make the least satisfactory showing, the general tendency being a falling away in favor, although the number of competitors who engaged in the Algonquin climb of 1910 and 1911 was as high as fifty-five. The chart, Fig. 4, dealing with the four most important hill-climbs shows that the average list of contestants varies between a range of twenty to fifty. The actual number of average entries in these contests is thirty-two, as shown in Fig. 5, which also gives the comparative length of the average entry list, obtained from figures extending over several years, of speed contests and hill-climbing events. It will be observed that in general the speed races favor the smallest field of competitors, with an average of seventeen cars.

It is true that the size of the entry list is not of itself a conclusive measure of value or popularity; the size of the audience is a factor that would furnish a truer perspective. Unfortunately these figures are not easily available and in the case of reliability trials on the open road are quite out of the question. However, it may be stated with a fair degree of accuracy that the average number of spectators who witnessed the important speed contests for the past few years is in the neighborhood of 35,000, while the audiences at hill-climbs averaged 25,500, as shown in Fig. 2.

One of the most interesting sets of figures, charted in Fig. 6, indicates the fluctuation in the cars entered from year to year in the four classic races. The rather sudden drop for 1912 in the Indianapolis curve of entrants is not continued, but takes a satisfactory upward turn for 1913, the list of entries just out numbering thirty-one.

# A. C. of C. Holds Its First Business Meeting

## A. B. of T. and N. A. A. M. Passed Out of Existence—Chamber's First General Meeting in Detroit May 19

NEW YORK CITY, May 7—The members of the N. A. A. M., Inc., and of the A. B. of T. have agreed unanimously to the plans adopted by their respective executive committees for the dissolution of the two associations and the consolidation of their interests in the newly-organized Automobile Chamber of Commerce. Meetings of the executive committees of the two bodies were held today. They were the last gatherings at which anything more than routine will be transacted. Tomorrow the members of the N. A. A. M., Inc., which is a Connecticut corporation, will meet at Hartford and vote to take the necessary legal steps to disband. It is intended that on the following day the Automobile Chamber of Commerce will commence active work.

The meeting of the A. C. of C. will be held at Detroit on Monday, May 19. At the meeting held today the following members of the executive committee of the A. C. of C. were present:

Charles Clifton, Charles C. Hanch, Samuel T. Davis, W. T. Leland, Windsor T. White, William E. Metzger, H. O. Smith, Albert L. Pope, L. H. Kittredge, H. H. Rice. Col. George Pope, the treasurer of the body, was also present.

Following is a short history of both the A. B. of T. and the N. A. A. M., which now have been merged into the A. C. of C.:

The Automobile Board of Trade was founded during May, 1911, and was originally composed of some fifty members of the dissolved Association of Licensed Automobile Manufacturers who had built motor cars under the Selden basic patent. This body had included a large number of automobile makers. The A. L. A. M. sought to enforce the Selden patent until early in 1911 when the principal suit of the A. L. A. M. against Henry Ford was lost by the decision of Judge Hough. Then the A. L. A. M. members began to plan a reorganization for the purpose of taking up other patents of general importance to the industry. The result of these considerations was the Automobile Board of Trade, with H. A. Bonnell as acting general manager.

The N. A. A. M. was organized November 10, 1900 at the first show held at New York. The first executive committee meeting was held on December 3, 1900. The association was incorporated on May 4, 1904.

As a partner of the Automobile Club of America, it governed the shows at Madison Square Garden. It remained until 1903 the *only* association of automobile manufacturers in this country. While so remaining it took upon itself the control of shows, the regulation of contests, the prosecution of good roads work, attention to legislative matters, the adoption of a warranty, the standardization of certain features of car construction and other interesting things. The control of shows was one of its first and most important undertakings.

The Selden patent and the formation of the Association of Licensed Automobile Manufacturers, popularly known as the Licensed Association, brought great changes. Following its formation the opposition organized the American Motor Car Manufacturers' Association, popularly known as the Unlicensed Association. The National Association, no longer the only one, became a house divided against itself, though it did not fall.

The licensed association took Madison Square Garden, where the National had formerly held sway, and conducted a show for the benefit of its members. The opposition took the Grand Central Palace for the unlicensed makers. The revenue of the National Association, as far as the New York show was concerned, was cut off. Meanwhile the association continued its control of the Chicago show, which gave it the necessary revenue to carry on its work.

The freight department of the association, backed by the numbers and influence of a united industry, became a real power and its value increased ten fold. The commercial vehicle committee became so active that its work is among the most important the association has done. The show committee jumped into the breach and headed off threatened opposition in New York. The membership committee became so active that it has added sixteen members to the roll, so that the association has now 105 upon the list, by far the greatest number in its history.

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### Regal Trebles Its Capital Stock

DETROIT, MICH., May 3—The capital stock of the Regal Motor Car Co. has been increased this week from $1,000,000, to $3,000,000. Of the latter amount, $2,600,000 has been subscribed for and paid in, while the remaining $400,000 of preferred has been set aside as a reserve for any future needs of the business.

The personnel of the Regal company has been altered somewhat, in that C. R. Lambert, John Lambert and Bert Lambert, who formerly held the positions of president, secretary and treasurer, respectively, have retired from active participation in the management. Fred W. Haines, former vice-president, has been made president, he at the same time retaining the general managership. H. H. Emmons has assumed the duties of secretary and treasurer. There is no vice-president under the new régime.

Although retiring from active capacities, the Lamberts will still remain on the Regal company's directorate, which includes Mr. Haines and Mr. Emmons in addition.

The concern's schedule calls for a production of about 7,500 cars this year, and with the present activity this figure will undoubtedly be reached. The Regal company has always enjoyed a healthy foreign trade.

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### Bostonians Settle 1914 Show Plans

BOSTON, MASS., May 5—A meeting of the Boston Commercial Motor Vehicle Association was held here on May 1, and the matter of holding a truck show for 1914 was fully discussed. It is planned to open the passenger car show on March 7 and close it on Saturday, March 14, and to open the truck show on the following Tuesday, March 17, and close it Saturday, March 21.

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INDIANAPOLIS, IND., May 7—*Special Telegram*—C. B. Warren, who is leaving this state, resigned as president of the Indiana Automobile Manufacturers' Association last night. H. O. Smith, president of the Premier Motor Mfg. Co., was elected to succeed him. Carl G. Fisher was elected a director.

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### U. S. Rubber Earnings $91,000,000

NEW YORK CITY, May 7—The annual report of the U. S. Rubber Co., for the fiscal year ending March 31, 1913, which has been published here today, gives the total gross earnings during that period as $91,782,861.87, the net profit being $10,475,706.97 and the total income $10,559,830.46. The net profit, after deducting interest for funded indebtedness, etc., was $7,544,217.67.

The latter figure amounts to about 8 per cent. of the net sales, and from it $5,799,955 of dividends have been paid. The surplus after these payments is $1,744,262.67; together with moneys from the Rubber Goods Mfg. Co. common stock, etc., the surplus is $11,299,129.65, which together with previous surpluses, leaves the company a total surplus of $28,735,736.80, out of which a common stock dividend of $8,000,000 was paid. Net profits exceeded dividend payments by $1,730,755.36. Regular dividends of 8 per cent. on the first preferred and 6 per cent. on the second preferred stock were paid, as well as 4 per cent. payments on the common during the first quarter and 6 per

### Early Metropolitan S. A. E. Meeting

NEW YORK CITY, May 7—The S. A. E. Metropolitan Section will hold its monthly meeting on May 27 instead of May 29, due to the visit of the British engineers, who will arrive on May 26 and will leave on the morning of May 28 for Pittsburgh. On the evening of May 26, an informal beefsteak dinner will be held in the Jungle room of Healy's restaurant, and on the following evening the monthly meeting in the ballroom of the McAlpin hotel. The problem of engine starting will be taken up, many starter manufacturers will have representatives at the meeting and a discussion will follow the reading of the papers.

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### Meteor Motor Car Co. Replaces Clark

SHELBYVILLE, IND., May 6—*Special Telegram*—The name of the Clark Motor Car Co., whose plant and other assets were purchased last week at a receiver's sale by interests headed by Maurice Wolf, of Chicago, has been changed to the Meteor Motor Car Co. The new company organized under this name will continue the manufacture of cars in Shelbyville, building two models, one of 30 horsepower and the other of 40 horsepower. Production of cars under the new regime is in progress, the first shipment leaving the factory today.

cent. during the last, in addition to a 20 per cent. stock dividend declared in July.

During the year the first preferred issue has been increased from $40,000,000 to $70,000,000 and the common stock from $25,000,000 to $40,000,000, the second preferred having become convertible into first preferred. In addition to an enlargement of the company's plants, those of the Rubber Regenerating Co. have been acquired.

The report gives the company's assets as $185,770,827.52 of which $105,687,667.88 is credited to property and $7,456,804.28 to cash on hand.

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## Klaxon Company Increases Stock

NEW YORK CITY, May 5—The Lovell-McConnell Mfg. Co., of Newark, N. J., has just increased its capital to $2,000,000, half of which is common stock and half 7 per cent. preferred stock. The officers of the company remain the same. No stock will be offered in the open market, but the entire issue will go to people active in the company's factory.

—

## Batavia-Seamless Suit to Court

NEW YORK CITY, May 6—The Seamless Rubber Co., of New Haven, Conn., has filed its answer to the complaint of the Batavia Rubber Co. which demands that the Seamless concern cease to manufacture tire treads resembling that of the Batavia company. The defendant has denied all the allegations made in the complaint, and the matter will come to trial. It is hardly probable that the suit will come up in court before the opening of the fall term.

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## Paige Company Plans Expansion

DETROIT, MICH., May 3—At the annual meeting of the board of directors of the Paige Motor Car Co., held recently, Alexander McPherson retired from the directorate and his place was taken by J. F. Bourquin, general manager of the company. No other changes were made in either the directors or the officials. The latter are H. M. Jewett, president; E. H. Jewett, vice-president; Gilbert Lee, treasurer; William B. Cady, secretary, and J. F. Bourquin, general manager. The directorate is composed of the following: H. M. Jewett, E. H. Jewett, E. D. Stair, S. L. Depew, W. E. Buhl, Gilbert Lee, J. F. Bourquin, C. H. Hodges and C. B. Warren.

The Paige company plans increased activity, and to this end H. M. Jewett has given up active participation in his other interests in order to devote more time to the affairs of the Paige concern. A new plant is contemplated to take care of the increasing business.

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## Maritime-Singer Six for Canada

LONG ISLAND CITY, N. Y., May 6.—The Palmer & Singer Mfg. Co. of this city has completed arrangements with the Maritime Motor Co. of St. John, N. B., Can., whereby the latter will assemble in its factory six-cylinder cars made from parts made by the Long Island company and known as Maritime-Singer Six, the cars to be practically identical with the sixes built in Long Island, having 45-horsepower, 128-inch wheelbase, and being fitted with two, four or five-passenger bodies. The price is to be about $3,000 Canadian money. The St. Johns factory operates now at the rate of seven cars a week.

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## Matheson Plant Sale on May 20

WILKES-BARRE, PA., May 5—The property of the Matheson Automobile Co., now in bankruptcy, will be sold here at auction on May 20. The sale will be under the control of receiver in bankruptcy W. C. Shepherd, formerly president of the company. The property will be offered for sale in separate parcels, although it is hoped by some parties that the sale will be preliminary to a resumption of manufacturing operations and not a dissolution sale.

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DETROIT, MICH., May 3—Nothing definite as to the future plans of the Warren Motor Car Co., which went into the hands of a receiver recently, has yet been decided. A statement of the condition of the company and an inventory of its stock and equipment are now being prepared. The Detroit Trust Co. has been appointed receiver for the concern.

## Automobile Securities Quotations

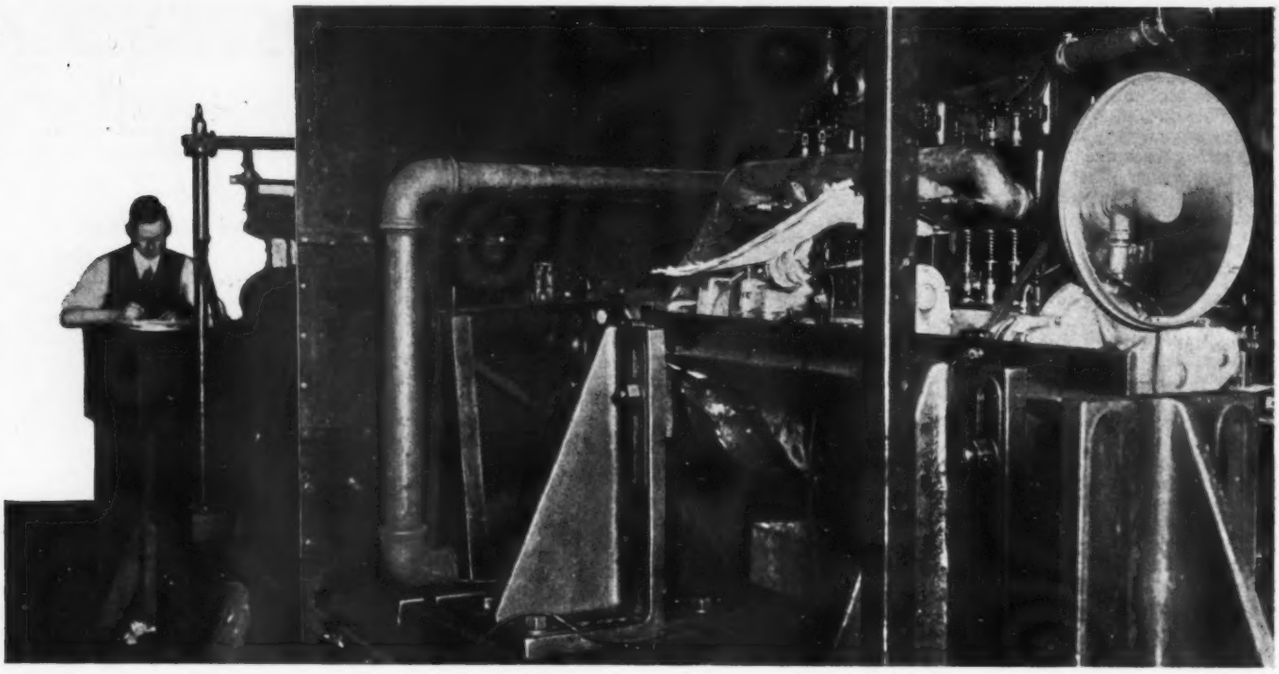
The amount of trading during the week was limited, although the market as a general proposition showed a fair amount of strength. Ajax-Grieb, Firestone, and Goodrich all scored advances, the last named rising 15 points over last week's closing figure. Miller Rubber, on the other hand, fell off as many points. General Motors, Lozier and Overland declined.

| | 1912 Bid | 1912 Asked | 1913 Bid | 1913 Asked |
|---|---|---|---|---|
| Ajax-Grieb Rubber Co., com | .. | 130 | 155 | .. |
| Ajax-Grieb Rubber Co., pfd | 95 | 100 | 95 | 100 |
| Aluminum Castings, pfd | 100 | .. | 98 | 101 |
| American Locomotive Co., com | 42 | 43 | 34½ | 36 |
| American Locomotive Co., pfd | 109 | 109½ | 100 | 103½ |
| Chalmers Motor Company, com | .. | .. | 128 | 138 |
| Chalmers Motor Company, pfd | .. | .. | 99 | 102 |
| Consolidated Rubber Tire Co., com | 9 | 11 | 15 | 18 |
| Consolidated Rubber Tire Co., pfd | 40 | .. | 60 | 75 |
| Firestone Tire & Rubber Co., com | 262 | 264 | 265 | 290 |
| Firestone Tire & Rubber Co., pfd | 107 | 109 | 105 | 106½ |
| Fisk Rubber Company, com | .. | .. | .. | .. |
| Fisk Rubber Company, pfd | .. | .. | .. | 100 |
| Garford Company, preferred | 99 | 101 | 99 | 100½ |
| General Motors Company, com | 33½ | 34 | 23 | 26 |
| General Motors Company, pfd | 72 | 74 | 70 | 75 |
| B. F. Goodrich Company, com | 84 | 85 | 32 | 34 |
| B. F. Goodrich Company, pfd | 107 | 108½ | 91 | 93 |
| Goodyear Tire & Rubber Co., com | 236 | 240 | 325 | 331 |
| Goodyear Tire & Rubber Co., pfd | 105 | 106 | 99½ | 100⅜ |
| Hayes Manufacturing Company | .. | 104 | .. | 90 |
| International Motor Co., com | 33 | 35 | 5 | 5½ |
| International Motor Co., pfd | 93 | 96 | 12 | 16 |
| Lozier Motor Company | .. | 55 | .. | 20 |
| Maxwell Motor Co., com | .. | .. | 3 | 5¼ |
| Maxwell Motor Co., 1st pfd | .. | .. | 40 | 50 |
| Maxwell Motor Co., 2nd pfd | .. | .. | 12 | 16 |
| Miller Rubber Company | 160 | 165 | 140 | 150 |
| Packard Motor Company | 105 | 106½ | 98 | 102 |
| Peerless Motor Company, com | .. | .. | 35 | 45 |
| Peerless Motor Company, pfd | .. | .. | 95 | 100 |
| Pope Manufacturing Company, com | 30 | 34 | 16 | 19 |
| Pope Manufacturing Company, pfd | 74½ | 75½ | 50 | 53 |
| Portage Rubber Co., com | .. | .. | 35 | 41 |
| Portage Rubber Co., pfd | .. | .. | 85 | 90 |
| Reo Motor Truck Company | 9 | 10½ | 11⅜ | 12⅛ |
| Reo Motor Car Company | 24 | 25 | 20 | 22 |
| Rubber Goods Mfg. Co., pfd | 104 | 109 | 100 | 105 |
| Studebaker Company, com | 38½ | 40 | 27½ | 28 |
| Studebaker Company, pfd | 96 | 98 | 89 | 93 |
| Swinehart Tire Company | 112 | 114 | 85 | 90 |
| U. S. Rubber Co., com | 57 | 57½ | 63¼ | 64¼ |
| U. S. Rubber Co., 1st pfd | 113½ | 114½ | 104¾ | 105¼ |
| White Company | 107½ | 108½ | 107 | 109 |
| Willys-Overland Co., com | .. | .. | 58 | 61 |
| Willys-Overland Co., pfd | .. | .. | 85 | 92 |

## Market Changes of the Week

Tin had its usual change, this week rising $.50 per hundred pounds. An improved consuming demand was also noted, with a fair amount of speculative buying. The London market was steady. Lead experienced a drop of $.15, the market remaining quiet, following the reduction in prices by the leading interests. Dealers report a rather light demand for domestic scrap, and according to reports from some other cities the demand has latterly fallen off, notably at Boston, where little business has been transacted of late, and the tendency of prices there is reported to be downward. Automobile tire scrap is calling at $.10 per pound. After a fairly steady opening cottonseed oil dropped to $6.87 per barrel, at a loss of $.04. This was caused by the weaker tone to the provision markets and the indifference of the consuming demand. Both petroleums experienced no changes, the prices remaining constant. Reports given say that the wells in the West are working good. Gasoline remains at $.22 1-4 per gallon sold in 200-gallon lots. Electrolytic copper showed a slight gain of $.00 1-8 per pound due to more active trading conditions.

| Material | Wed. | Thurs. | Fri. | Sat. | Mon. | Tues. | Week's Change |
|---|---|---|---|---|---|---|---|
| Antimony, lb. | .07⅝ | .07⅝ | .07⅝ | .07⅝ | .07⅝ | .07⅝ | ..... |
| Beams & Channels, per 100 lbs. | 1.61 | 1.61 | 1.61 | 1.61 | 1.61 | 1.61 | ..... |
| Bessemer Steel, ton | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | ..... |
| Copper, Elec., lb. | .15½ | .15½ | .15½ | .15½ | .15⅝ | .15⅝ | +.00⅛ |
| Copper, Lake, lb. | .15⅝ | .15⅝ | .15⅝ | .15⅝ | .15⅝ | .15⅝ | ..... |
| Cottonseed Oil, bbl. | 6.91 | 6.89 | 6.87 | 6.85 | 6.86 | 6.87 | —.04 |
| Cyanide Potash, lb. | .19 | .19 | .19 | .19 | .19 | .19 | ..... |
| Fish Oil, Menhaden, Brown | .33 | .33 | .33 | .33 | .33 | .33 | ..... |
| Gasoline, Auto, 200 gals. | .22¼ | .22¼ | .22¼ | .22¼ | .22¼ | .22¼ | ..... |
| Lard, Oil, prime | .95 | .95 | .95 | .95 | .95 | .95 | ..... |
| Lead, 100 lbs. | 4.50 | 4.50 | 4.50 | 4.50 | 4.35 | 4.35 | —.15 |
| Linseed Oil | .49 | .49 | .49 | .49 | .49 | .49 | ..... |
| Open-Hearth Steel, ton | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | 29.00 | ..... |
| Petroleum, bbl., Kansas crude | .88 | .88 | .88 | .88 | .88 | .88 | ..... |
| Petroleum, bbl., Pa., crude | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | 2.50 | ..... |
| Rapeseed Oil, refined | .68 | .68 | .68 | .68 | .68 | .68 | ..... |
| Silk, raw Italy | .... | 4.35 | .... | .... | 4.35 | 4.35 | ..... |
| Silk, raw Japan | .... | 3.72½ | .... | .... | 3.72½ | 3.75 | +.02½ |
| Sulphuric Acid, 60 Baumé | .90 | .90 | .90 | .90 | .90 | .90 | ..... |
| Tin, 100 lb. | 49.63 | 50.00 | 49.60 | 49.60 | 49.88 | 50.13 | +.50 |
| Tire Scrap | .10 | .10 | .10 | .10 | .10 | .10 | ..... |



Packard motor in the A.C.A. testing laboratory undergoing its long endurance test which equals a trip across the continent

# Packard Motor Steady

## First Half of 200-Hour Heavy Duty Test Goes Off Smoothly

NEW YORK CITY, May 7—For more than 84 hours the Packard six-cylinder 4 by 5.5-inch motor now on test at the laboratory of the Automobile Club of America, has been steadily pounding away at the rate of 1,200 revolutions per minute. This is a model 38 motor taken from stock and driven in a touring car from Cleveland to New York. It arrived here Friday noon and at 10:43 Saturday night it was started on its long test.

For 200 hours the motor will be run at its maximum power at the rate of 1,200 revolutions per minute. The throttle is wired wide open, the magneto is wired so that the spark is fully advanced while the laboratory staff works night and day in 8-hour shifts, keeping a constant record of the performance of the motor. To all appearances the motor is running just as it did when it started.

A test of this kind uses 60 gallons of gasoline every 200 hours. In 1 hour the motor will have turned over 72,000 times or 1,730,000 revolutions per day. At the end of 200 hours the motor will have revolved 14,400,000 times. At 1200 revolutions per minute with the standard gear ratio of a touring car, the car will be traveling at the rate of 37 miles an hour. This is 888 miles per day or for the 200 hours amounts to 7,400 miles. Should the test be continued for 300 hours it will correspond to a traveled distance of 11,100 miles. At the end of 300 hours the crankshaft will have revolved 21,600,000 times.

Observations are made constantly according to the conditions printed in THE AUTOMOBILE for May 1 and no sign of weakness has as yet developed. A blast of air to parallel road conditions is used to cool the crankcase and the water is pumped to a cooling tank instead of through the radiator.

## Ford Makes 1,000 Cars a Day

DETROIT, MICH., May 3—The making of 1,000 automobiles a day is no longer a press agent's dream, for on several days during the month of April just passed the production of Ford model T automobiles has equalled or exceeded that figure. Averaging the entire month of April, the daily output of the Ford plant has been 869 cars per each 24 hours. Of course, there were some days when the number turned out fell somewhat short of the 1,000 mark, while on others it was considerably overshadowed.

During May the Ford production department expects to average in the neighborhood of 900 completed machines each working day. This means that on some days the number leaving the works will have to be greatly in excess of 1,000 to make up for the days when it falls below.

Such figures are hard to realize when it is considered that many a prosperous factory does not make many over 1,000 automobiles a year, to say nothing of a quantity equal to a single month's Ford output. During April there were about 21,000 Fords offered to the world. For March there were exactly 17,364 produced, with a total value of $10,000,000, in round numbers. Thus, April showed an increase of manufacture of about 21 per cent. over March. At this rate it looks as if there will be no trouble in meeting the schedule of 200,000 machines as planned.

The company's records for the first half of the fiscal year ending with March and extending over the months of October, November, December, January, February and March, show that for this period a business of $47,000,000 was done, which establishes a new mark in the annals of automobiledom. The sale and delivery of 78,462 cars for the past 6 months is in excess of the entire number turned out by the company for the previous fiscal year by about 5,000 cars. The past half year's quota swells the total number of Fords produced from the beginning of manufacture up to April 1, 1913, to 234,753.

## Licenses for New York Operators

ALBANY, N. Y., May 3—The McGrath bill was passed in the Legislature yesterday, after having been amended seven times. All automobile operators must be licensed. In its present form the law gives to the secretary of state the power to suspend or revoke any license after a hearing and 10 days' notice to the owner thereof, if he has been shown to be guilty of reckless driving.

The amendment reads in part as follows:

"Application for a license to operate motor vehicles as an operator or chauffeur may be made, by mail or otherwise, to the Secretary of State or his duly authorized agent upon blanks prepared under his authority.

"Special licenses shall be issued to chauffeurs, but before such license is granted the applicant shall pass such examination as to his qualifications as the Secretary of State shall require. The Secretary of State shall appoint examiners and cause examination to be held at convenient points throughout the state as often as may be necessary. Every application for a chauffeur's license shall be accompanied by two photographs of the applicant in such form as the Secretary of State shall prescribe, such photographs to be taken within 30 days prior to the filing of such application and to be accompanied by the fee provided therein.

"As regards to licensing chauffeurs, the bill provides for a more liberal license fee and a reduction of the renewal. The first license shall be $1.00 and no charge for a renewal; this is a change from $5.00 for new license and $2.00 for renewal.

"The Secretary of State is empowered to suspend or revoke any certificate of registration or any license for the following causes: Three violations of the speed provisions in one year, conviction of felony, physical or mental disability, intoxication or the use of drugs, negligence or reckless driving."

# Makers Object to Tariff

## Proposed Chassis Reduction Is a Joker, Says Manufacturers' Protest

TWENTY-SEVEN manufacturers of American-made passenger cars have protested to Congress against the new tariff on motor cars and motor car parts. The chief ground of protest is on the reduction of the duty on chassis from 45 to 30 per cent. and further on the reduction of duty on finished parts of cars, not including tires, from 45 to 20 per cent. These manufacturers take the view that the present Underwood tariff takes care of the foreign manufacturer and the foreign workman by opening the American market to them on the lowest possible terms. The protests further goes on to state that importers and representatives for foreign manufacturers were consulted and their advice taken, whereas the American manufacturer seeking to defend his business and his employees from foreign cheap labor products has been utterly ignored.

The protest goes on to show that not only a slight modification of the existing duty of 45 per cent. was necessary to be entirely satisfactory to European factory representatives in this country and that if the duty were reduced from 45 to 33 or 30 it would give the European makers entry to the American market at satisfactory rates of profit to them.

The protest further says: "It certainly is a joker to have finished automobiles in the tariff schedules at 45 per cent. and to have automobile chassis listed at 30 per cent. . . . Practically all of the imports of motor cars are in the form of chassis. The chassis is the thing the European manufacturer wants to bring in at the minimum rate of duty. European manufacturers do not manufacture bodies except to a very small extent, as bodies are too bulky and subject to damage in shipping and too expensive to ship by reason of their bulk in proportion to their value. Does it seem like a joker to have a Ways and Means Committee put its stamp of approval on the 45 per cent. rate of duty for finished automobiles exactly as it was done by the Payne-Aldrich bill and then place a rate of duty of 30 per cent. on the chassis?"

Further: "The chassis itself is really a completed automobile and it is the thing the European manufacturer wants to bring in at the minimum rate of duty. It is the part requiring the ingenuity, the invention, the expensive material, the elaborate work of skilled manufacture chiefly represented in expense by American labor at American wages and American material. There is practically no material now imported. It is all made in this country. Magneto factories, parts makers, etc., have been transplanted to America and motor car factories also under the present Payne-Aldrich tariff."

The second joker consists in admitting finished parts at 20 per cent. duty.

The protest goes on to show how it is the parts that make the car and that the chief cost of its chassis consist in the material in these parts and the labor bestowed on them, whereas the labor necessary to properly bring them together into a chassis is a minor one, and the negligible per cent. of the chassis cost.

The protest continues: "Is a European manufacturer going to import these products into America as chassis at 30 per cent. duty, when he can ship it at less cost of freight and enter it at 20 per cent. and have simply to assemble the various parts into a chassis at a cost of approximately 1 per cent.? It is clear that the foreign manufacturer will provide for uniting or assembling the imported parts in America. Chassis as such will only be imported by the foreign manufacturer who is without sufficient means to establish an assembling branch in America."

In conclusion: "The man in the grocery business who buys an American automobile sees his money distributed in payroll to the American workmen making that automobile, who, buying groceries or clothing, spend it in his store. With free trade or a tariff reduced to the point of ready admission of foreign automobiles or parts this same grocer or clothier sees his money going to Europe to pay foreign workmen and to be spent for foreign groceries and clothes. With the purchase of the American automobile, the buyer benefits the American manufacturer, the American workman and himself. With the tariff reduced to admit foreign automobiles, the purchasers of them take away the means of existence of the American motor car manufacturer, the American workman and himself to just that extent.

"The motor car industry is deserving of credit for the large export trade which has been built up as the result of great national prosperity at home, which has enabled it to adopt manufacturing methods, to reduce the cost of production, and enter into the war for the world's commerce with European concerns who are better located as to freight, fully equipped with American machinery and with cheap labor available at approximately half to two-thirds that paid American labor.

"The total American export trade of all kinds has grown to exceed the enormous sum of $2,000,000,000 annually. This could not have been done without a condition precedent to it of prosperity, first in America, which properly has given the ways and means and ability to engage in the fight for world-wide commerce. Prosperity at home is the first necessary factor for increase of export trade.

The protest is signed by the following, constituting a committee of five representing the 27 manufacturers mentioned below.

John N. Willys, vice-president, Willys-Overland Co.; W. S. Leland, general manager, Cadillac Motor Car Co.; Charles Clifton, treasurer, Pierce-Arrow Motor Car Co.; Hugh Chalmers, president, Chalmers Motor Car Co., and Henry B. Joy, president, Packard Motor Car Co.

The following are the manufacturers represented by the above committee:

John S. Clark, vice-president, Autocar Co., Ardmore, Pa.
A. F. Benjamin, general sales manager, American Locomotive, New York, N. Y.
V. A. Longaker, general manager, American Motors Co., Indianapolis, Ind.
H. W. Ford, secretary, Chalmers Motor Co., Detroit, Mich.
W. C. Leland, vice-president, Cadillac Motor Car Co., Detroit, Mich.
J. J. Cole, president, Cole Motor Car Co., Indianapolis, Ind.
G. W. Bennett, vice-president, The Garford Co., Elyria, Ohio.
Elwood Haynes, president, Haynes Automobile Co., Kokomo, Ind.
Chas. D. Hastings, secretary, Hupp Motor Car Co., Detroit, Mich.
S. T. Davis, Jr., president, Locomobile Co. of America, Bridgeport, Conn.
G. A. Kissel, president, Kissel Motor Car Co., Hartford, Wis.
Joseph M. Gilbert, president, Lozier Motor Co., Detroit, Mich.
Leo A. Feif, general sales manager, Mitchell-Lewis Co., Racine, Wis.
Geo. M. Dickson, secretary, National Motor Vehicle Co., Indianapolis, Ind.
Geo. O. Daniels, vice-president, Oakland Motor Car Co., Pontiac, Mich.
O. C. Hutchinson, vice-president, Olds Motor Works, Lansing, Mich.
Henry B. Joy, president, Packard Motor Car Co., Detroit, Mich.
L. H. Kittredge, president, Peerless Motor Car Co., Cleveland, Ohio.
Charles Clifton, treasurer, Pierce-Arrow Motor Car Co., Buffalo, N. Y.
George Pope, treasurer, Pope Mfg. Co., Hartford, Conn.
H. M. Snyder, secretary, Reo Motor Car Co., Lansing, Mich.
H. B. Staver, Staver Carriage Co., Chicago, Ill.
W. H. Whiteside, president, Stevens-Duryea Co., Chicopee Falls, Mass.
Frederick F. Fish, president, Studebaker Corporation, South Bend, Ind.
Robert W. Allen, general manager, Warren Motor Car Co., Detroit, Mich.
Windsor T. White, president, White Co., Cleveland, Ohio.
John N. Willys, president, Willys-Overland Co., Toledo, Ohio.

## Yosemite Park Open to Motorists

WASHINGTON, D. C., May 3—Secretary Lane today rescinded an order which bars automobilists from Yosemite Park, on the grounds that thereby a large proportion of the people will be enabled to enjoy the beauties of the National Park.

AUGUSTA, ME., May 5—The legislature has passed a law creating a state highway commission of three members and authorizing the issue of $2,000,000 bonds to be spent solely on highway construction.

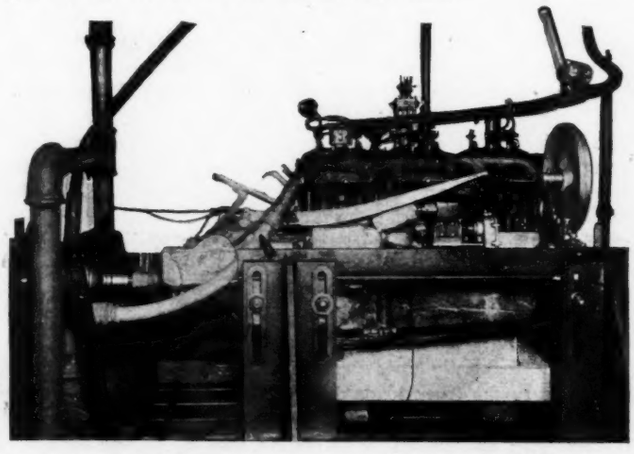
## $3,000,000,000 Road Plan Proposed

WASHINGTON, D. C., May 1—National and state co-operation in a $3,000,000,000 expenditure for good roads—$1,000,000,000 being for construction and $2,000,000,000 for maintenance, and both extending over a period of 50 years—are proposed by a plan submitted this week by Jonathan Bourne, Jr., former Senator from Oregon, to the joint committee on federal aid in the construction of post roads.

His plan contemplates that the billion-dollar construction fund shall be apportioned among the states upon the basis of area, population, assessed valuation and road mileage, and that the several states shall deposit in the U. S. Treasury their 50-year 4 per cent. bonds for the amount due them, and the Government loan the states the par value thereof for road construction, the Government raising its fund by the sale of its 50-year nontaxable 3 per cent. bonds. By crediting each state every year with the excess 1 per cent. interest paid by the state to the Government over what the Government pays on its bonds and allowing 3 per cent. interest compounded annually on said excess 1 per cent., a sinking fund is established from which the Government pays off the bonds at the end of 50 years and the state is relieved of the payment of principal on its bonds.

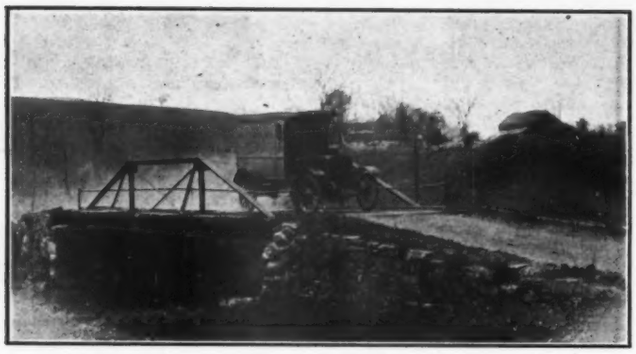
The Government will also, under this plan, pay to each state annually for road maintenance an amount equal to 2 per cent. of the amount of bonds on deposit, provided the state expends a like amount.

NEW YORK CITY, May 7.—Under the provisions of the Pollock bill, which has just passed the legislature of New York state, it will be possible for bus companies operating in New York City to compete with the Fifth Avenue line, which has long held a monopoly. A new company, the Electric Coach Co., with a weighty financial backing is seeking a franchise and expects to have 1,000 electric four-wheel-drive buses operating on New York streets by the end of the season. The fare is to be 5 cents.



Packard 38 six-cylinder motor mounted for 200-hour test

Start of eighteen trucks which participated in the Washington Post commercial car run



Atterbury truck crossing the Hyarthtown bridge, Maryland

# Trucks Do Well in Run

HARRISBURG, PA., May 6—With approximately one-half of its distance covered the Washington Post motor truck demonstration reached here early this afternoon, having all of its original eighteen contestants and three non-contestants in line, as well as all of the various passenger cars used by officials.

Eight of the eighteen contestants still have perfect road scores these being Mais, Wilcox. Hupmobile, McIntyre, Lauth-Juergens, two Whites and an International. The three non-contestants are ambulances entered by Major P. L. Halloran, of the United States army and two of these, a White, has still a clean sheet, the other carry slight penalties.

The total run, which will take in 4 days and cover 288.7 miles of country, will come to an end in Washington, D. C., Thursday evening after which the trucks will be given brake, clutch and transmission tests as well as a technical inspection. The daily itinerary has averaged 72 miles with night stops at Hagerstown, Md.; Harrisburg, Pa.; Hanover, Pa.; and Washington, D. C. The trucks carry their full load as catalogued, this in many cases being bags of gravel carefully weighed before the start of the run and in other cases merchandise. Each one carries in addition to its driver an official observer. During noon contols, which are from 1 to 2 hours in length to give citizens at the noon stops an opportunity of examining them, the trucks are parked under police protection so that no meddling can be done with them. At night they are similarly parked, so that any work done on them from start to finish will result in penalization.

The speeds on the roads vary from 9 to 12 miles per hour according to the truck loads, but on the first 2 days these have been entirely too slow, for the dry roads passed over, although if rain were encountered it is certain that all of the time afforded would be required.

The following are the loads carried: Under 1,500 pounds load 12 miles; 1,500 to 2,000 pounds 11 miles; 2,000 to 5,000 pounds, 10 miles; 5,000 to 8,000 pounds 9 miles per hour. The following are the entries, their official speeds, loads and penalties to date:

| No. | Name | Entrant | Capacity | Sp'ds | Penalties |
|---|---|---|---|---|---|
| 1 | Vulcan | Commercial Garage | 8000 lbs. | 9 | 189 |
| 2 | Mais | Mais Motor Truck Co | 3000 lbs. | 10 | 0 |
| 3 | Little Giant | Motor Truck Corp | 2000 lbs. | 11 | 12 |
| 4 | Witt-Will | Witt-Will Co | 2240 lbs. | 10 | 43 |
| 8 | Rowe | Rowe Motor Mfg. Co | 4000 lbs. | 10 | 47 |
| 9 | Hupmobile | Wash. Auto Service Co | 800 lbs. | 11 | 0 |
| 10 | McIntyre | W. H. McIntyre Co | 3000 lbs. | 10 | 0 |
| 11 | Autocar | Autocar Sales & Service Co. | 3000 lbs. | 10 | 23 |
| 12 | Lauth-Juergens | Lauth-Juergens Motor Car Co | 4000 lbs. | 10 | 0 |
| 13 | Atterbury | Atterbury Motor Car Co | 1500 lbs. | 12 | 3 |
| 14 | Atterbury | Atterbury Motor Car Co | 2000 lbs. | 11 | 6 |
| 15 | Atterbury | Atterbury Motor Car Co | 3000 lbs. | 10 | 101 |
| 16 | Atterbury | Atterbury Motor Car Co | 4000 lbs. | 10 | 29 |
| 17 | White | The White Co | 1500 lbs. | 12 | 0 |
| 18 | White | The White Co | 3000 lbs. | 10 | 0 |
| 19 | International | H. B. Leary, Jr. | 1000 lbs. | 12 | 0 |
| 20 | Atterbury | Atterbury Motor Car Co | 1500 lbs. | 12 | 128 |
| 100 | Brown | Major P. L. Halloran | Ambul'ce | 12 | 3 |
| 101 | Four-Wheel-Drive | Major P. L. Halloran | " | 12 | 15 |
| 102 | White | Major P. L. Halloran | " | 12 | 0 |

## No 1912 Los Angeles-Phoenix Race

PHOENIX, ARIZ., May 1—It has been practically decided that there will be no Los Angeles-Phoenix race this year. Conditions are so unsettled on the coast that the members of the Maricopa Auto Club, who have promoted the race for 5 years, do not believe it will be possible to hold it with any satisfaction next fall. They hope to promote a race from El Paso, sanctioned by the A. A. A. instead.

## Texans to Build Speedway

SAN ANTONIO, TEX., May 1—The San Antonio Automobile Club and the Texas State Highway Assn. have under consideration the construction of a 2-mile speedway here to take the place of the present short racing course. The proposition is being urged by Dr. W. A. Hering, president of the club, and John W. Warren, president of the association. It js meeting with enthusiastic endorsement.

PHILADELPHIA, PA., May 3—Preliminary plans and regulations that are to govern the interclub reliability run to Gettysburg, to be held on June 7, under the joint auspices of the Quaker City Motor Club, the Automobile Club of Philadelphia, the Automobile Club of Germantown and the Delaware County Automobile Club, have been completed.

The run is to be open to members of the four organizations mentioned, who are private owners and not connected with the automobile industry. Members of the trade are invited to accompany the run as non-contestants. The Interclub Road Run trophy will be awarded the club having the most teams finishing with a perfect score, the entrants being divided into teams of five for each club.

PHILADELPHIA, PA., May 4—Favored by ideal weather and road conditions, the local automobile contest season was opened yesterday when the Quaker City Motor Club conducted its sixth annual sociability run to Atlantic City, N. J. Forty-one cars were officially entered, of which thirty-one checked in at the Hotel Strand

# Thirty-One Cars for Indianapolis Race

INDIANAPOLIS, IND., May 5—When the list of entries was closed for the 500-mile race to be held at the Indianapolis Motor Speedway, May 30, it was found thirty-one cars had been entered for the long grind. This is seven more entries than there were in the race last year. Two of the entries are unknown, and may not be announced until the elimination trials.

It is said that the race will present one of the most thorough representative international motor car races ever held. Most of the entries this year have been made by factories, both of the United States and abroad. This year will see several foreign drivers, whereas heretofore the foreign entries have been by American owners with American drivers.

The qualifications for the race are that cars must not exceed 450 cubic inches piston displacement, must have a minimum weight of 1,600 pounds and must be able to do 75 miles an hour.

The seat sale is proceeding in a most satisfactory manner. Preparations for the race are also making excellent progress. There will be better hotel accommodations than in the past, because two large hotels, one of seventeen stories and the other of twelve stories, have been built since the race last year. The complete list of entries follows, together with some of the mechanical details of the cars:

| No. | Car | Cyls. | Bore In. | Stroke In. | Disp. Cu. In. | Driver |
|---|---|---|---|---|---|---|
| 1 | Nyberg | 6 | 6 | 4 | 389 | H. Endicott |
| 2 | Stutz | 4 | .. | .. | ... | Merz |
| 3 | Stutz | 4 | .. | .. | ... | Anderson |
| 4 | Keeton | 4 | 5 3/32 | 5.5 | 387 | Burman |
| 5 | Mason | 4 | 4 5/16 | 6 | 350.5 | Evans |
| 6 | Mason | 4 | 4 5/16 | 6 | 350.5 | Tower |
| 7 | Unknown | .. | .. | .. | ... | ..... |
| 8 | Stutz | 4 | .. | .. | ... | Herr |
| 9 | Sunbeam | 6 | 3.54 | 6.29 | 380.8 | Guyot |
| 10 | Henderson | .. | 4 5/16 | 6 | 350.5 | Knipper |
| 12 | Fox Special | 4 | 4.75 | 5.5 | 389 | Wilcox |
| 14 | Smada | 4 | 3.5 | 5 | 192.4 | Adams |
| 15 | Peugeot | 4 | .. | .. | ... | Goux |
| 16 | Peugeot | 4 | .. | .. | ... | Zucarelli |
| 17 | Amel | 4 | 4.5 | 5 | 318.1 | Liesaw |
| 18 | Schacht | 4 | 4 ⅜ | 5.5 | 410.6 | Jenkins |
| 19 | Mercer | 4 | 4.8 | 6 3/16 | 447.9 | De Palma |
| 20 | Mercer | 4 | 4.8 | 6 3/16 | 447.9 | Bragg |
| 21 | Mercer | 4 | 4.37 | 5 | 299.7 | Wishart |
| 22 | Mercedes-Knight | 4 | 3 5/16 | 5⅛ | 250 | Pilette |
| 23 | Pennebaker-Stearns-Knight | 4 | 5⅛ | 5⅛ | 443.5 | Pennebaker |
| 24 | Tulsa | 4 | 4¼ | 5.5 | 389.9 | Clark |
| 25 | Mercedes | 4 | 4.4 | 7⅛ | 440.8 | Mulford |
| 26 | Isotta | 4 | 120 mm | 160 mm | 443.86 | Grant |
| 27 | Isotta | 4 | 120 mm | 120 mm | 443.86 | Tetzlaff |
| 28 | Isotta | 4 | 120 mm | 160 mm | 443.86 | Not named |
| 29 | Case | .. | .. | .. | 450 | Disbrow |
| 30 | Case | .. | .. | .. | 450 | W. Endicott |
| 31 | Case | .. | .. | .. | 450 | Nikrent |
| 32 | Unknown | .. | .. | .. | ... | ..... |
| 33 | Mason Special | .. | .. | .. | ... | Haupt |

CHICAGO, May 5—Additional improvements planned for the Kane County circuit by the Elgin Automobile Road Race Association promise to make the course one of the fastest in the country, and one that even will threaten the Santa Monica course's supremacy. If a speed of close to 80 miles an hour cannot be maintained in the Elgin National race next fall, it will be surprising. These contemplated improvements mean that the Kane County course will be in reality an 8.5-mile circular speedway, with no sharp right-angled turns.

At a meeting of the Elgin Automobile Road Race Association yesterday it was decided to build a new turn at the east end of the course.

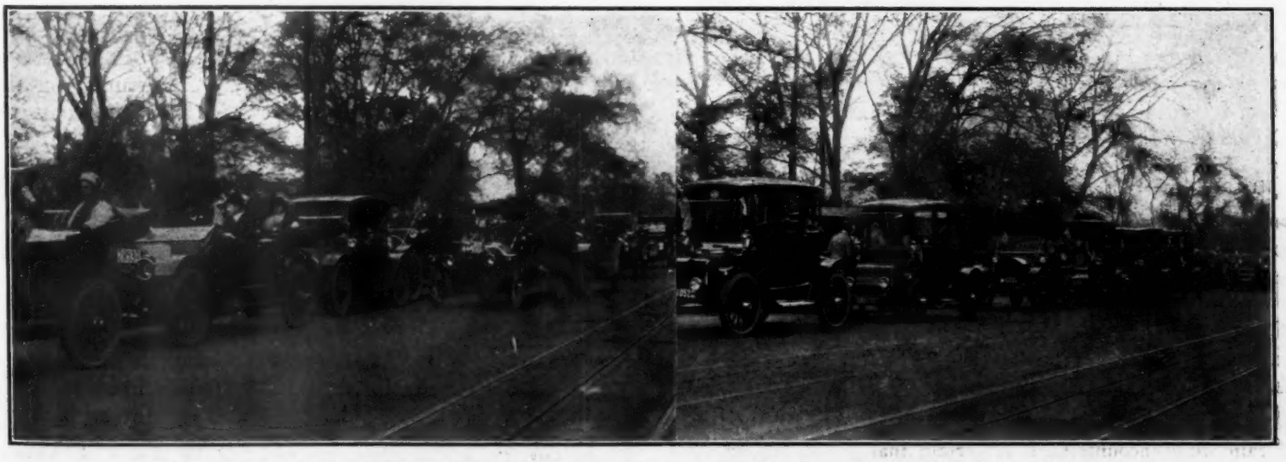
The Elginites will again close with the Chicago Automobile Club to handle the meet. They also have contracted for a covered grandstand and several concessions have been let.

## Motor Dealers Secret-Time Run

NEW YORK CITY, May 2—The recently organized Motor Dealers' Contest Association held its first contest of the season this evening, which took the form of a secret-time sociability run from Columbus Circle to Hotel Cedarcliff, New Rochelle, 17.5 miles. Fifty-four cars started in the gasoline and electric division. The secret time for the gasoline cars was 56 minutes and 21 seconds, and the winning car was J. T. Kelly's Overland, which took 56 minutes and 10 seconds; second prize, W. Cullem, DeDion, 56 minutes 50 seconds; and third prize, Miss Stella Mayhew, Regal, 55 minutes 21 seconds. Gold, silver and bronze medals were awarded.

Nearly a score of electrics contested for the W. C. Poertner Cup. Their running time was 80 minutes 17 seconds, a speed of 13 miles per hour. Mrs. A. E. Waxham, in a Waverley, was first, 84 minutes 49 seconds. P. S. Rogers, in a Waverley, was second, 72 minutes 36 seconds, and a Baker entered by the New York Edison Co. was third, 68 minutes 57 seconds.

White truck near South Mountain in Washington run



At the left is part of the gasoline division of the run to New Rochelle. Electric division at the right

The AUTOMOBILE

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# Testing Out the Motor Trucks

*IT is generally conceded that the early reliability contests did much to quicken the devlopment of the passenger car. The 200-mile mountain climbs showed up weaknesses in brake construction, in cooling facilities, in running gear details and in not a few other lines. These same makers who learned their valuable passenger car lessons are today averse, in many cases, to entering in truck competitions. They claim that they are not needed. They claim that the passenger car trials taught them all that it was necessary to know.*

*The motor truck is more and more becoming a vehicle of inter-city work and the requirements for such service are often quite different from those in city service. This is chiefly so in hilly districts where severe strains are placed on the motors and brakes. The present truck demonstration through the states of Maryland and Pennsylvania is proving that in several cases brakes are not adequate for the long mountain descents, the same as was discovered in the touring car field 8 years ago. The long mountain climbs are showing the necessity for adequate radiator capacity.*

*Apart from the valuable lessons that truck demonstrations teach the maker direct, they play a big part by the enthusiasm they create along the route, which is particularly so when efforts are made to give the business people at noon and night stops an opportunity not only to look over the trucks but also to talk with the factory managers who accompany the demonstration.*

# Reducing the Automobile Tariff

THE announced reductions in the tariff on automobile chassis and parts from 45 to 30 and 20 per cent. respectively has, as tersely pointed out in a brief recently issued by twenty-seven leading American automobile makers, placed in the hands of the foreign maker a weapon that he can wield with danger to some of the American factories, in that the flat reduction of 15 per cent. on chassis coupled with his cheaper labor and modern machines will enable the foreign maker to readily compete in certain car fields with the home-made product on a much more favorable ground than formerly.

In manufacturing cars, the foreigner secures labor that often does not cost one-third the price of American labor, but today he has a still further advantage that he did not possess a few years ago, namely, he has fitted his factory up with the most approved machinery purchased in America.

Heretofore, the American maker has excelled the makers of all other countries in production. Automatic and multiple machines have so far outdistanced the old-fashioned foreign methods that the cheap labor question of Europe was offset. Today matters are changing. The foreigner is cutting his costs of manufacture and consequently will be a stiffer competitor in America than he has been. In the past conditions have been sufficiently favorable that where foreigners have been well represented on this side of the Atlantic they have been able to build up a very large market. True, only one or two have so taken advantage of the conditions, but they have existed, nevertheless, and if under the 45 per cent. rule they have made such progress what can be expected under a 30 per cent. regime?

The American manufacturers point out that in the reduction of duty on spare parts from 45 to 20 per cent. an opportunity will be offered to ship the separate parts in and assemble them and so place them on the market at an enormous price reduction as compared with today. There is little danger at present of this because it would call for a greater speculative investment than most of the foreign concerns would be willing to make. To build an assembly factory in this country would mean to produce 2,000 cars or over and few of the concerns would venture on such a risk. Practically all of the importation of parts will, as in the past, continue to be for replacement of cars now running.

It is, however, up to the American maker to look to his fences. He must cast the microscope around his engineering department, around his manufacturing methods, around his selling force and around his maintenance organization.

Letting down the bars, as the tariff proposes, pushes our makers out into world-wide competition burdened with a labor handicap, also handicapped in that the European maker is a more experienced exporter and has been developing his market in all parts of the world for the last 10 years, whereas the American builder has been engaged in that time filling home demands. Every economy in manufacture will have to be looked to. Motion study will have to be made a greater study in all production departments; and the designers will practically be compelled to design with a view to economy of manufacture.

# Detroit S.A.E. on Kerosene and Aluminum Alloys

DETROIT, MICH., May 2—That kerosene carburetion and aluminum alloys are especially live subjects in the automobile industry just at present, was demonstrated by the large attendance at the meeting of the Detroit Section of the Society of Automobile Engineers on May 1. Vice-chairman Cornelius T. Myers called upon P. S. Tice for the first paper, under the title of "Some of the Difficulties of Kerosene Carburetion." Mr. Tice first gave a résumé of the characteristics of kerosene and their relation to gasoline under the following heads: (a) greater specific gravity, (b) higher viscosity, (c) less volatile, kerosene being practically non-volatile at the ordinary temperatures in this latitude, (d) about the same specific heat, (e) two and one-half times the latent heat of vaporization, or about 680 British thermal units per pound for kerosene, (f) more diverse composition with more and more widely assorted foreign matttr in suspension in the commercial product.

### Difficulties with Kerosene

Of the difficulties encountered in kerosene carburetion, he said that the change of viscosity with change of temperature was especially hard to deal with, since the ratio between kerosene and gasoline of the rate of flow through a small orifice is 1.74 from 40 to 140 degrees Fahrenheit. This means that the motor has to be nursed until the whole system warms up, and to give flexibility and economy, it is necessary to supply the conventional type of carbureting device with additional heat. With the high boiling point and a latent heat of vaporization of about 680 British thermal units per pound it requires approximately 900 British thermal units to vaporize kerosene from an initial temperature of 40 degrees Fahrenheit. Prohibitive difficulties may easily arise from the very high temperatures necessary to furnish the fuel with the required heat units in the very short time available. The relative non-volatility of any of the constituents of kerosene, below 135 to 140 degrees Fahrenheit has proven the greatest trouble in producing a commercially successful kerosene carbureter, for it is practically impossible to start witht a cold motor and carbureter on this fuel.

The second part of Mr. Tice's paper dealt with the results of a preliminary investigation of kerosene fuel carried on by him in the laboratory of the Holley Brothers' Co. Tre results of this research were given graphically by curves shown by means of lantern slides. The runs were made on a Ford motor with the regular carbureter and manifold replaced by a T-manifold with short branch to which was attached a vertical copper tube. At the lower end of the tube a series of venturi-like throat pieces could be fitted. The flow of fuel was controlled by the relative position of the jet to the venturi neck. There was no throttle of the ordinary type. The copper tube was wound with resistance wire through which an electric current was passed, the amount of current being controlled by a rheostat. The kerosene used had a specific gravity of .817. One set of curves was plotted between pounds of kerosene per brake horsepower-hour and mixture temperature. These were for two conditions, that of minimum temperature for starting with a cold motor and that of minimum temperature for steady running. These curves showed that to start with a cold motor it was necessary to have a mixture temperature of from 170 to 250 degrees Fahrenheit, depending upon the richness of the mixture. The leaner the mixture, the higher the temperature necessary. The steady running temperatures varied with the richness of the gas from 76 to 120 degrees Fahrenheit. Normal conditions required temperatures of 220 and 100 degrees Fahrenheit, respectively.

Another set of curves showed the effect of mixture temperatures upon economy. The difference in economy for different temperatures was very marked and with conditions varying from very light to almost full load and at several speeds it was found that the greatest economy lay between mixture temperatures of 150 to 170 degrees Fahrenheit.

The last slide brought out the fact that with a kerosene mixture at 160 degrees Fahrenheit, the fuel consumption per brake-horsepower-hour at different speeds was much lower than that considered very good with a standard carbureter on the same motor under the same conditions of speed and load but without heating. These results were under close throttling of the motor.

In the discussion following the Tice paper, W. S. Hovey spoke of the progress of the Sheffield Car Co. in injecting kerosene and even lower grade oils in two-cycle railroad and marine motors.

Geo. A. Kliesrath then described a test trip with an Overland car equipped with the new Ray Harroun carbureter. This device uses kerosene which furnishes the required heat at the jet by passing all of the exhaust through it. Starting on a cold motor was accomplished by feeding gasoline to the inlet manifold during the time that the self-starter was cranking. The performance of the car was very satisfactory, tests being made for acceleration, sustained speed, idling, etc. The fuel economy was excellent considering the very bad roads encountered in the flood district of Indiana and Ohio.

It had been the experience of both Mr. Tice and Mr. Kliesrath that it is necessary to heat the fuel or the mixture when using kerosene and not to pre-heat the air as is now common practice in gasoline carburetion. Neither had intentionally used water with the mixture for the purpose of decreasing carbon deposits or preventing pre-ignition. The motors in both cases were of the same compression as used with gasoline. It was also brought out by several members that the pounding or bumping of the motor which has been noticed with kerosene and sometimes with gasoline, when starting, is probably due to a poor distribution of fuel between the different cylinders.

The second paper dealt with a comparison of aluminum alloys. Claude E. Cox showed several charts giving the possible alloys with aluminum and the results of a large series of tests of different alloys and under varying conditions. It is possible to alloy aluminum with many other elements, such as gold and silver, but those with which we are most familiar are the alloys with copper, zinc, and more recently, magnesium, as in duralumin and magnalium. The data presented pointed to quite a variation in the physical properties for the different kinds and proportions of the alloys, and also that the pouring temperatures made a great difference in the strength of the castings. Probably the most interesting chart indicated that the strength of an aluminum casting decreased markedly with an increase of the temperature of the piece.

### Aluminum Casting Practice

Following the talk by Mr. Cox, J. P. Carritte read a paper dealing with the shop practice in casting aluminum with especial reference to what is known as McAdamite metal. This metal was perfected by William McAdams, and is an aluminum-zinc compound, handled by a special method in shop practice production. Mr. Carritte gave some foundry rules for obtaining especially good castings, among them being the use of graphite crucibles, the rubbing of pots and receptacles with graphite and the avoidance of iron skimmers. These precautions are advisable because of the great and detrimental affinity of aluminum for iron and silicon. For the same reason he recommended that no turnings be used in the scrap, because of the iron which comes from the tools. In the McAdamite castings, for which extra strength is claimed, the virtue seems to lie not only in the alloy, but more especially in the method of handling the casting and molding. A molding compound of carborundum, carbon, French clay, charcoal, etc., is used in the same manner as in ordinary sand practice, and by this means quick chilling is accomplished the same as if the metal were poured into iron molds. The latter practice, however, would be commercially impracticable. Tests by Prof. Henry Souther and other authorities showed some very interesting results as to its strength. Although in regular practice this metal does not run to extreme strength, it is possible to make special McAdamite castings which will average 33 1-3 per cent stronger in all directions than the No. 12 and other ordinary aluminum alloys. Mr. Carritte favors the zinc alloys, and also looks forward to the time when we shall produce aluminum from many other sources besides that of bauxite.

In the discussion which followed these papers questions were asked concerning a new fluxing material, of which about 6 ounces are used to 100 pounds of aluminum. It seems that some very favorable results have been obtained with it in a few Detroit foundries, but that just what it is still is more or less of a secret. It is said that a party of engineers has just left for the locality where deposits of this flux are found, and that it is soon to be brought forward commercially.

There will be no June meeting of the Detroit section, as the National body of the S. A. E. will leave this city with their English guests on the fourth of the month. The semi-annual meeting will be held upon the steamer City of Detroit III during the voyage to the Soo.

*Upper—Two cloudbursts had changed this alkali road 4 miles east of Laramie into a swamp hole for a distance of 8,100 feet. Three distinct sets of wheel tracks may be seen where automobiles have tried to avoid the pitfalls of those who had gone before. This one bad spot in a distance of many miles could be eliminated by using the earth on the sides to build up the center, with a cross-culvert to take care of the water that runs back and forth on the low ground at each side. It took a car 1 hour with outside assistance to make this 100 feet. Vertical arrows indicate a board over a cross-under drain which was badly choked.*

*Lower—An average example of the culvert type of bridge out in Wyoming in the plateau country. Owing to a bend in the channel of the occasional small stream, the far bank has been gradually washed away until it no longer protects the posts on which the end plates rest. These plates have now started to tip out of place. The length of the earth rest when first built can be judged from the position of the bridge and at the right of the picture. There are three bridges in a distance of 200 yards. Circle shows end supports falling away from lack of protecting wings.*

# A Transcontinental Hodge-Podge

By Ernest L. Ferguson

## Part III

## From Denver to Salt Lake City

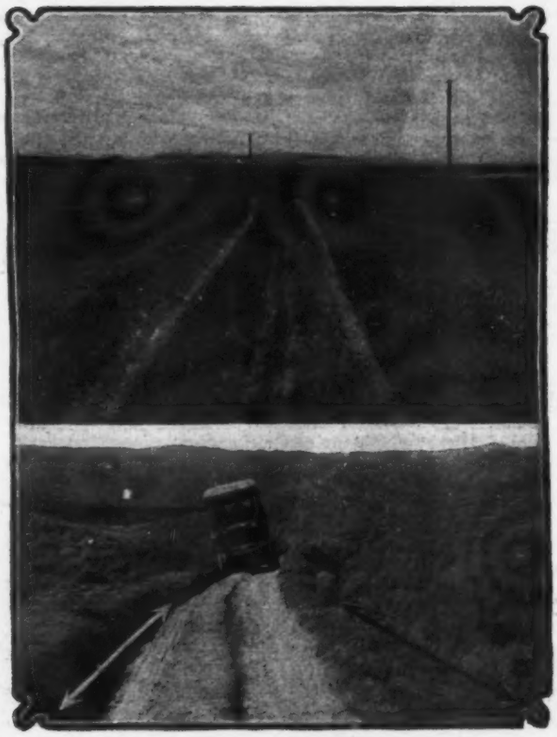
FROM Denver to Salt Lake City by the way the motorist travels is 600 miles. You traverse portions of three states: one-sixth of the trip is northward through Colorado, where you have an opportunity of enjoying all the scenic beauties and far-famed mountain scenery that is to be found west and north of Denver. Leaving Colorado you practically cross the lower end of Wyoming, in fact two-thirds of the Denver-Salt Lake leg is through this state. These 400 miles are monotonous being over plains with sage brush, and while you cross the Rockies in this distance, you are scarcely aware of them because you work your way through them instead of over them. If it were not for your route book you might miss knowing them.

From north of Denver to the Rockies, near Wamsutter the soil is alkali with only occasional outcroppings of rock. This alkali makes a most excellent road, excepting in very wet weather. It is not difficult for the tourist to average 18 miles per hour with equipment. This pace will be slowed down at a dozen places by dry washes which cross the road. They are gulches 3 to 5 feet deep. There used to be a section of road 30 miles long between Table Rock and Point of Rocks, through what is familiarly known as the Bitter Creek section that is filled with these gulches, but a new road is now built 10 to 15 miles further north. It is free from gulches, also 6 miles shorter between these points.

From the Rocky Mountains to the Wyoming-Utah state line, the same general character of roads continues; and from the state line to Salt Lake City there is that positive change of road mentioned. It is a natural highway, well cared for, and being rapidly improved with concrete culverts and grading. The last 10 miles into the Mormon Mecca, through what is known as Parley's Canyon, is a gorgeous trip. The road is narrow and winds through the heavily wooded canyon accompanied on one side by a running stream along the banks of which the local people spend much time in camping and fishing.

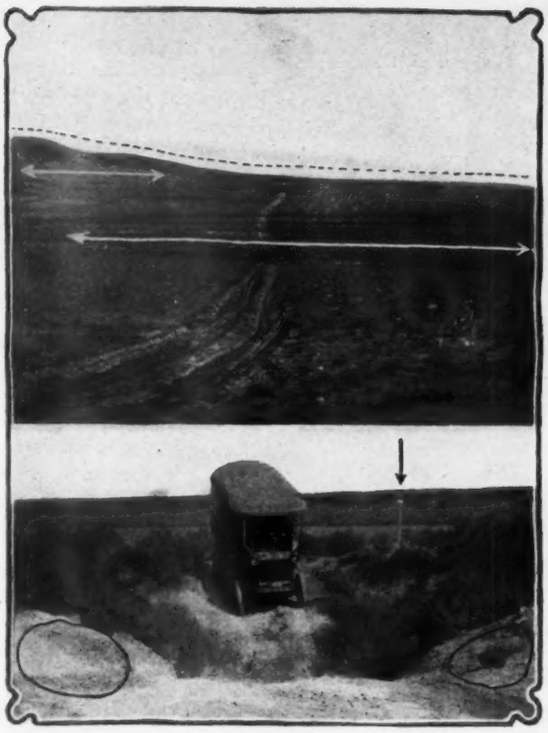
Although the Denver-Salt Lake City stage of the trip takes you through the mountains, there is really not a bad grade in the whole 600 miles.

From the eastern slope of the Rocky Mountains to the Great Salt Lake the most traveled trans-continental automobile route continues to follow the old-time trail of early Western history. This leads one across the



*Upper—This shows a section of a 70-mile stretch that does not vary 2 per cent. in grade or character in its distance across the eastern Wyoming plains between Laramie and Medicine Bow, and over what is known as the Laramie plains. Because it is some miles away from the railroad, for more of which distance it is to be abandoned, and a new road is now being finished between the same points, near the railroad for automobile travel. It is an alkali soil and naturally well drained.*

*Lower—This long, winding climb west of Hanna, Wyo., had a fairly good surface up to 1912 when a series of unprecedented heavy rains, locally known as cloudbursts, washed away so much that there is now a high center. Only one side ditch, on the right, had been provided. With the large area, sharp slope and frequency of rainfall this ditch could not take care of the surface drainage. The result is shown by the deep gulley on the left. A new roadway is now planned 2 miles to the right that will have a more gradual rise and that will not have to drain so great an area. In crossing Wyoming there are four such stretches, each 1 mile in length. Arrows indicate deep side ditches—road washed out by heavy rains.*



*Upper—One of Wyoming's broad expanses of alkali with but scant growth of any kind at Preston and Continental watershed. It is 8 miles long. The dotted line in this particular expanse is the Continental watershed. The trail that shows is maintained in its distinct marking almost entirely by transcontinental and other automobile touring. Upper arrow is good bench for road bed. Lower arrow shows an alkali bottom.*

*Lower—One of the conditions that must be watched in touring across the plateau country is the dry wash west of middle of the State. These are in groups of two or three and three such groups in a distance of 100 miles. These have very steep banks, are frequently 3 to 5 feet deep and rarely more than 2 feet wide at the bottom. The rise out of them is so sharp that more often than not the front wheels are at the top before the rear wheels come to the bottom. A car will run in and out of them on its own power. Circles show banks of earth thrown out to ease the approach.*

entire State of Wyoming near its southern border for over 400 miles. Some there are who have accused that state of having the poorest roads in the United States. If this were true, then many a state east of the Mississippi River could boast of its roads whereas facts compel them to silence by any comparison.

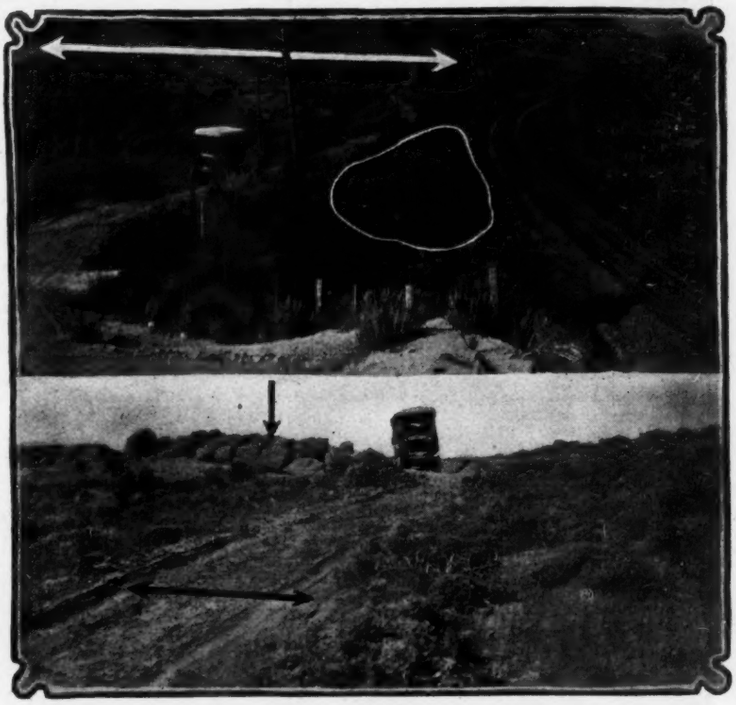
There are many miles of bad stretches and there has been one other that was notoriously vicious, but as an example of what is being done in Wyoming to improve touring conditions particular attention is here called to that one, of over 30 miles. It followed the curve of the railroad through the Bitter Creek and Black Butte country, forming a large Indian bow, and was a succession of viciously deep gullies. It holds a record of many broken frames.

With the influence of a trans-continental route association, having its headquarters at Cheyenne, a new road line across a plateau has been established that may be likened to the string of the bow. This not merely shortens the distance by about 7 miles but more important that that it gives a roadway without gullies and with no climbs of moment. At the present time it is hardly more than a trail through the sage brush though clearly defined by a very considerable amount of automobile travel. In its making the sage brush was dug out to give a roadway of single track width.

The state can also boast of as fine a piece of highway as is to be found in any traveling. This connects Rock Springs and Green River, a distance of 15 miles. The highway has been carefully engineered and keeps to only portions of the old roadway lines. It swings around hills instead of over them as did the old lines of travel; also it avoids the deeper hollows and greasewood bottoms either by a new line or by filling. The culverts are substantially made and protected by heavy rock work against the rush of waters from the nearby hills. The roadbed is of rock with a sort of shale surface and has all the delights of boulevard riding. The country between is wild in the extreme and taken all in all the contrasts between the highway and its surroundings never fail to mightily impress those who travel over its $40,000 surface.

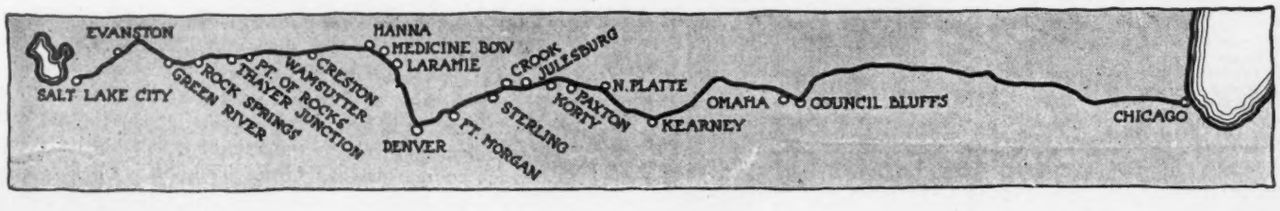
In viewing the Wyoming roads the tourist in passing over them often pronounces judgment without being consciously aware of the effects of surroundings. The long distances between habitations and settlements, together with the monotony of sage brush growth ever present, and the weather-scarred cliffs and mountains without a vistage of tree growth, have an influence not always realized.

Another point not to be overlooked is that the lack of roads is not so much a lack of appreciation as it has been a lack of needs. The state has been one distinctly devoted to grazing, and roads were of no material importance in that industry. Now that farming is being taken up, particularly along the line of the transcontinental route, the needs for



*Upper—The trail-like road that frequently for miles in Wyoming winds along one side or the other of the railroad between the latter and the mountain ranges in the central southern part of the State. These ranges are so broken in their lines that no real mountain climbing is encountered at any point. Grades are rarely over 8 per cent. One passes through rather than over the Rockies. It will be noted that in some places the road is along the lowest ground and again on the benches along the mountain side. White arrow shows a good road bench. Circle is a greasewood bottom.*

*Lower—It is not all alkali and sage brush. There are now and then bold croppings of rocks long distances from the mountain sides. Sometime these will become valuable as nearby road-making material. One-half way across State and at approach to the Rocky Mountain section. Vertical arrow indicates red granite rocks. Horizontal arrow is alkali soil.*



*Top—This bridge is amply strong and well designed to take care of any travel. However, it will be noticed that the support at the ends is such only as comes from resting on the natural soil. This is over a particularly deep gulley that drains a large area of mountain side. The rush of waters is washing away the soft earth bank as shown in the circle.*

*Upper Middle—Miles from any town, but paralleling the nearby railroad, the county authorities have filled in a roadway across an alkali flat the cracked surface of which can be partly seen on each side of a built-up section. The illustration shows the spot shortly after a series of rains that would have made impassable a road across the flat at Salt Wells in western Wyoming. Circles show alkali flats.*

*Lower Middle—An alkali flat after a few cloudbursts. This flat is only 2 miles from the one just described, having a built-up roadway. These flats have measurements varying from yards to miles in area. They are lower ground than their surroundings and are without a vestige of growth. While wet the soil varies from greasy slipperiness to a glue-like consistency that clings to anything. Circles show alkali baking out into flakes. Vertical arrows show ruts made by cars.*

*Bottom—Nearing the Wyoming-Utah line west of Evanston, Wyo., the earth is not so clearly alkali. Thereby it more readily lends itself to keeping in some reasonable condition where only traffic does the work. By keeping this road to the higher ground on the left more natural road soil would be found and better drainage. There are 10 miles of such road in this particular stretch. Circle indicates higher rocky soil.*

at least what might be called roadways is being felt and given attention.

Progressive thought in that line of progress is being devoted to the subject as evidenced in the recently passed law that places the convicts at the disposal of communities for road construction. A number of instances are already evident of work done in the past year and more is being planned. That a greater amount is not evident seems to come from the lack of a more general knowledge and understanding of the application of the law.

Fortunately for the tourist the average rainfall is from one-third to one-quarter that of Eastern states, because this immense elevated plateau, crossed by broken ranges of the Rocky Mountain system, is an alkali plain with occasional greasewood bottoms. And water-soaked alkali at all times surpasses the most energetic gumbo that ever was. There seems to be no limit to the depth that a car can sink in saturated alkali. Yet, when dried out by wind and sun it bakes to a surface that is as hard and smooth as the best asphalt road.

### Materials Are at Hand

Whenever the time comes that stone-road construction takes place in that state nature has placed the material close at hand all along the route. More frequently than not this is in a natural disintegrated condition of varying sizes that will require only screening to produce all the accepted road building aggregate. While some of this is of the sand-stone variety there are mountains—millions of tons—of very proper quality.

A condition of circumstances that materially benefits the tourist is the many miles of old railroad grading that is utilized as a roadway. Some years back the railroad, from various causes, in many places changed its roadbed for greater or lesser distances. In the days of that old railroad bed the grading was not carried to the tops of the ties, so that with their removal the intermediate cross ridges were of little height and soon disappeared under weather and travel, leaving a smooth surface.

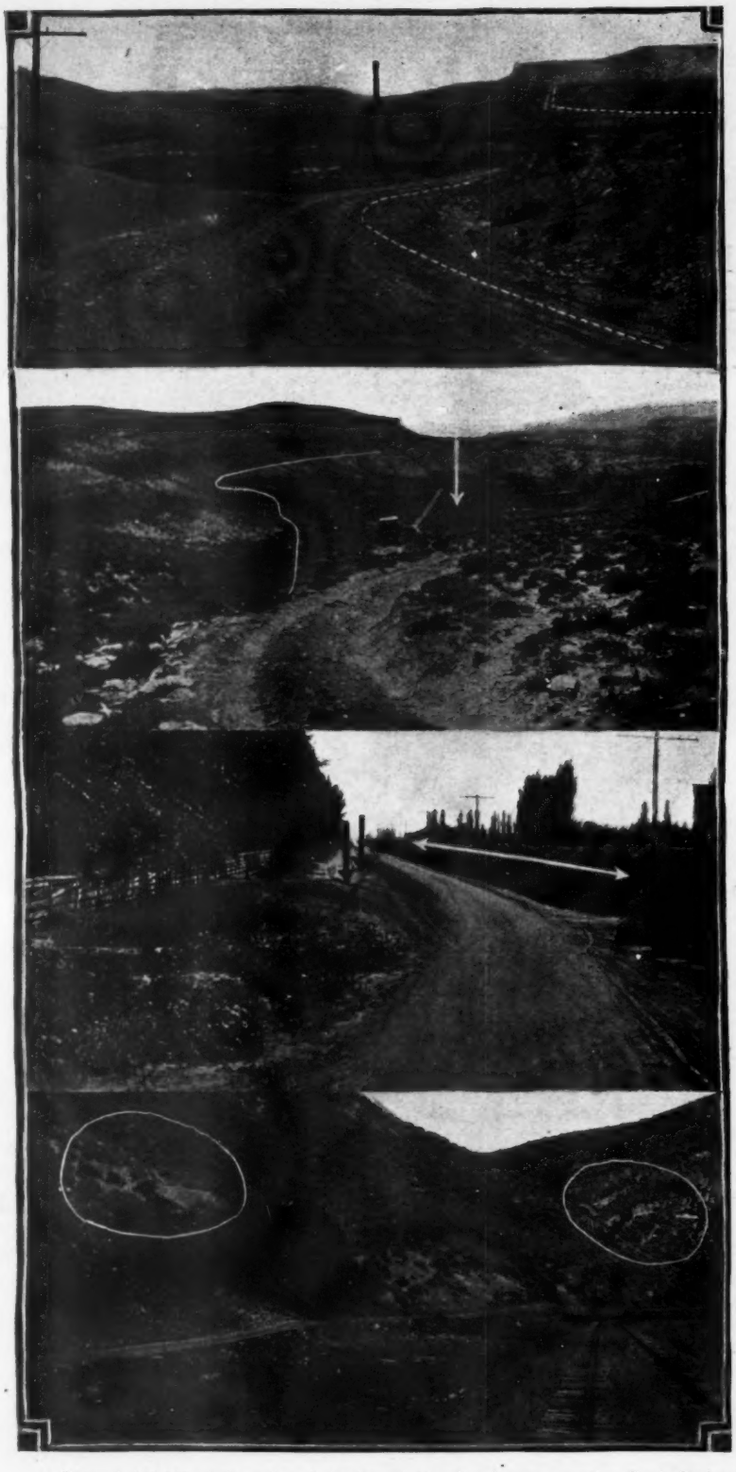
The result is a roadway that is cut through all hills it encounters as well as being filled in across low spots and ravines. One component of the old right of way that was not left when the grading was abandoned by the railroad company was the bridging across the dry washes that drain the country in its few rain periods. This means the travel is required to occasionally leave the grading and take to the side ground and obviously at the least desirable spots.

### Care Greatly Needed

Now and then where the grading reaches across deep fills the rain has gradually washed off some of the sides so that the traveled surface is barely wider than the tread of the vehicle. In the growing use, from trans-continental touring and local traffic, these places well need to be taken care of. From the same cause will undoubtedly come the replacing of bridges or culverts at the now existing gaps. All told, this will give something like 100 miles of excellent highway at a minimum cost of construction.

Throughout much of the country just east and west of the Rocky Mountains there is an elemental weakness in the method of constructing the bridges and culverts, even where the superstructure is well taken care of. That weakness is in the lack of abutment wings.

Such rains as they have are generally heavy and as the country is one of steep slopes, at varying angles to the line of travel, the waters do not flow but rush along such courses as they form. The alkali soil is without



*Top—A $40,000 shale and rock boulevard 15 miles long connecting Rock Springs and Green River, Wyo., winding its well-engineered way through one of the mountain ranges, west of the Rockies, in Wyoming. At each end is a town; between is not a habitation. The surrounding country is wild. Dotted line shows part of the old trail across the alkali bottom.*

*Upper Middle—West of Green River, at the west end of the boulevard, shown in (M), the road is bad only by comparison. The soil is of the same type, largely gravel, shale and rock. Arrow shows road across alkali bottom. Line shows good bench for a road.*

*Lower Middle—The importance of Salt Lake City and Ogden, and the value of the land between has brought about definite road construction, connecting the two, on modern lines. In the meantime the roadway yet to be completed by the engineers is in a generally excellent condition, although in places liable to have standing water because of high sides at certain points. White arrow is wide irrigation ditch. Black arrows show ruts indicating true character of soil.*

*Bottom—The canyons that lead into Utah from the east are narrow winding valleys. The soil is all that could be desired for the construction of roads. Even now the little attention that has been given has yielded a roadway that affords excellent touring, there being considerable rock and a lot of surface gravel that rapidly shape themselves under the minimum of attention. Circles indicate mountain sides of rock and gravel.*

body, and rapidly wears away along the banks of the narrow, suddenly formed streams. In constructing a bridge or culvert a frequent method is to carry the ends well beyond each bank onto what is at the time solid ground.

By this method or even where post or plank abutments are built it is only a question of time when the banks wash away to points beyond the abutments or the natural soil on which rests the floor timber ends.

With the construction of wings the banks at the ends of the structure would be materially protected. Owing to the powder-like consistency of alkali soil this protection could not have the permanence that would obtain in more homogeneous soil. There would be sometimes come the need for filling at the wings to prevent back water getting at the bridge ends, but this work can be reduced to a negligible quantity compared with what is now necessary if serious attention was given to prevent the present condition of washed-away bank ends.

**Choice of Two Branches**

Going west from the Wyoming-Utah state line the trans-continentalist for the second time is given the choice of taking either branch of a huge Y. The right one goes direct to Ogden, but, as in the case at the Nebraska-Colorado line, going by way of the left well repays the choice. This leads to Salt Lake City with its many attractions for the tourist, where a turn north is made to Ogden. This routing adds but 34 miles to the journey.

The branching takes place at Echo, Utah, and each has picturesque canyons with roadways constantly being bettered. Each branch is about the same in mileage, the added difference being the distance from Salt Lake City to Ogden and this is over a newly improved modern road.

Of the two branches the left one to Salt Lake City is the more improved and passes through well-settled farming districts, principally dairying, that are rapidly rebuilding their roads to take care of the necessary hauling of products to the railroad shipping points. Two-thirds of the way along this branch is a valley with as picturesque scenery as can be found anywhere, with one view equaling anything to be found in Switzerland. Coming down from the low divide into the city by the inland salt sea the canyon is one vast camping-out ground for fishing and hunting. The right-hand branch from Echo has one of the country's natural scenic wonders, the Devil's Slide, which is well worth the 10-mile trip from Echo, even though one decides to go via Salt Lake City.

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## Fuel Situation in Australia

SYDNEY, AUSTRALIA, April 10.—The price of fuel in this commonwealth is having its effect on the type of car being purchased. Fully 80 per cent of the cars registered are of the type represented by Ford, Overland, Buick, Hupmobile and a few similar makes. Such cars as these practically control the whole Australian market. Fuel in any of the cities costs 42 cents per gallon for heavy benzine, and this is now becoming the generally-used fuel. Gasoline cost 60 cents per gallon today. Now as most of our automobiles go into the back country, anywhere outside a 50-mile radius of any of the cities, the cheapest you can get benzine is 50 cents, and any man living off the railway line will pay 5 to 10 cents more. Another item to bear in mind is the cost of tires. Thirty-six to 4-inch tires cost from $50 to $60 retail, according to make.

# Detecting Resistance-Saving Fuel

## PART IV

### Accelerometer Readings Furnish Data for Plotting Close Approximation To Torque Curve of Motor—Maximum Grades for Each Speed Deduced

By Professor W. C. Marshall

¶ *This is the last and concluding part of Professor Marshall's article on the accelerometer. In this issue some more uses to which the instrument may be put and the results obtained from actual tests are given. It is shown that the torque curve of the motor at all speeds may be plotted from the information derived from the accelerometer. The amount of grade the car should be able to mount on each speed may be determined and plotted in the form of curves which will stand a lasting record of what the car should be able to do and which will give immediate information to the owner of the car when the torque of the motor drops off owing to some decrease in compression through poor valve seating or from any one of the many other possible causes.*

LET us examine the accelerating properties of the car, the resistance curve of which is shown in Fig. 1 by curve (A).

On this curve are plotted the torques exerted at the various gear reductions and the resistance exerted by hills of varying degrees of steepness, besides the resistance curve A.

From the motor torque curve obtained in the laboratory and published by the makers, we can construct the torque curve on direct drive when the wheels are 37 inches diameter and the gear ratio is 3 3-7 to 1.

The accelerating power at 20 miles per hour on direct drive is shown by the length of ordinate between curves A and 1 at 20 miles, which measures 157 pounds per ton.

This force acting on a mass weighing 1 ton will produce an acceleration of $F = \frac{121 \times 32}{2{,}000} = 2.5$ feet per second per second. At 40 miles per hour the force available for acceleration will be 121 pounds, which will produce an acceleration of $F = \frac{121 \times 32}{2{,}000} = 1.94$ feet per second.

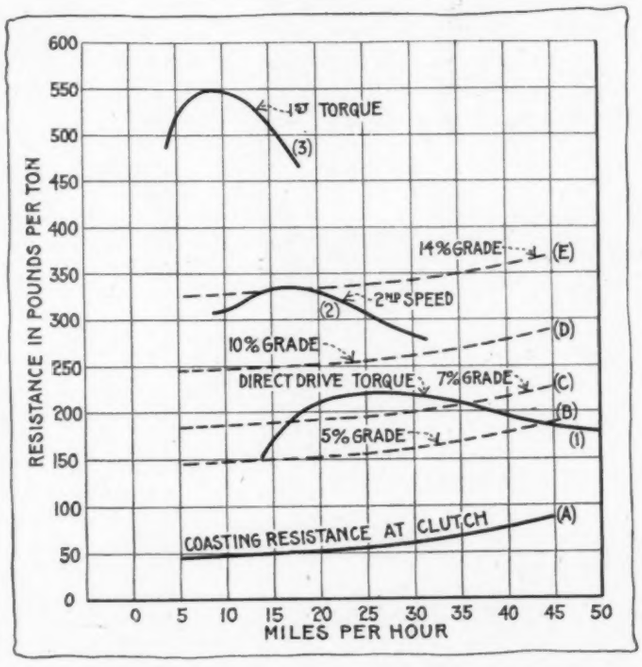


**Fig. 1—Showing the torque curves plotted for each speed. The readings along the torque curves give the amount of effort produced by the motor at the speeds shown along the abscissæ. The amount of resistance interposed to climbing the grade at any speed is shown along the grade curves given by the dotted lines. It is obvious that the point at which the engine effort or torque curve falls below the effort required to ascend the hill at that particular speed, the car will no longer be able to climb the hill. Therefore where the curves intersect shows the maximum hill that can be climbed on any gear at any speed. For instance, on direct drive the car could not ascend a 5 per cent. grade faster than 44 miles an hour. It will be noticed that the curves intersect at this point and this value could be used as one point on a curve of maximums**

The resistance curve of a 5 per cent. grade, with the coasting resistance, is shown by curve (B). The intersection of curves (B) and (1) shows the maximum speed obtainable on this grade, viz., 44 miles per hour.

A 7 per cent. grade could be mounted at 35 miles per hour. Above 7.5 per cent. it would be necessary to drop to second speed to mount the grade.

The acceleration produced on a 5 per cent. grade on direct drive at 20 miles per hour would be $F = \frac{55 \times 32}{2{,}000} = .88$ feet per second. At 15 miles per hour it would only be $F = \frac{18 \times 32}{2{,}000} = 0.288$ feet per second, which might prevent the car from mounting this grade at this speed.

If the speed was 20 miles when the car struck the grade it would probably go up without difficulty on the direct drive.

This of course is the usual policy employed by those driving through the country wherever they have a chance to rush a short steep hill and this often saves gear changing.

This shows the disadvantage some cars have when they can not increase their speed just before reaching a hill and in consequence must shift gears.

By inspection of the diagram in Fig. 1, one can see that this car could ascend a 13 per cent. grade, provided it started at a rate of 15 miles per hour on second speed. If the rate was 10 miles it would probably be necessary to shift gears and drop to first speed.

The maximum force which the motor of this car can exert is 550 pounds per ton to push the car at a speed of 9 miles per hour, whereas the motor of the car in Fig. 5, Part III, can exert 710 pounds per ton to push the car 5 miles per hour.

The 550-pound per ton force would enable the first car to ascend a 24 per cent. grade, but the second car could ascend a 31 per cent. grade.

As the latter car has a 4.5 by 5.5-inch motor and the other car a 4.25 by 5.5-inch, it seems quite probable that this is correct.

It the cases just treated it was assumed that the horsepower torque curve of the motor was known.

By means of the accelerometer we can determine the torque curve of the motor, approximately, in the following manner: Determine, first, the resistance curve at the clutch by declutching and reading the retardation at various speeds on the accelerometer. This test should include a run at the maximum speed of the car.

Plot this curve resistance.

Next make an acceleration test at 5 miles per hour intervals from 5 miles up to the maximum.

This consists in running at a constant speed in top gear at each interval, and reading the maximum acceleration in feet per second per second which it is possible to give the car by opening the throttle wide.

From these readings the torque curve of the motor can be plotted as curve (1) of Fig. 5 in Part III.

For example, suppose an average car running at a constant speed of approximately 20 miles per hour. The throttle is opened wide and the acceleration instantly given to the car is read on the dial of the accelerometer as 2.5 feet per second per second. This amount of acceleration by comparison with the opposite half of the graduated scale, is equivalent to a force of 158 pounds per ton. This is measured on the 20-mile ordinate above the resistance curve of the car and gives a point on the torque curve of top or highest gear.

After plotting the torque curve on the diagram of pounds resistance and miles per hour we can proceed to plot the motor torque curve on the basis of horsepower and revolutions per minute. The top speed gear ratio must be known as well as the driving wheel diameters to enable the revolutions per minute of motor to be determined from a given car speed in miles per hour.

Suppose the top speed gear ratio is 2.4 to 1. Taking a speed of 20 miles per hour with 36-inch wheels we find the motor is making 448 revolutions per minute.

The resistance overcome at the clutch is 158 pounds per ton plus 60 pounds for coasting resistance, a total of 218 pounds $\frac{218 \times 2 \times 20}{375} = 23.2$ horsepower which is laid off on a vertical ordinate erected at the 218 revolution per minute point of the horizontal base line.

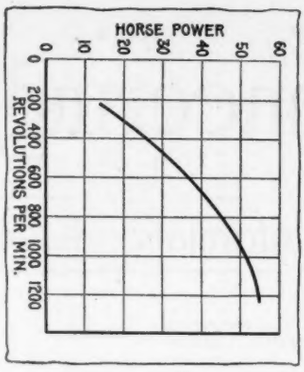


**Fig. 2—Result of a test made by the author Nov. 6, 1912, on a 1908 chain-driven car weighing 2 tons. The car was not equipped with a windshield. The results shown in this curve were obtained solely by accelerometer readings and were plotted by taking the intersections of the torque and resistance curves on various degrees of gradient. This gave the maximum horsepower at these speeds**

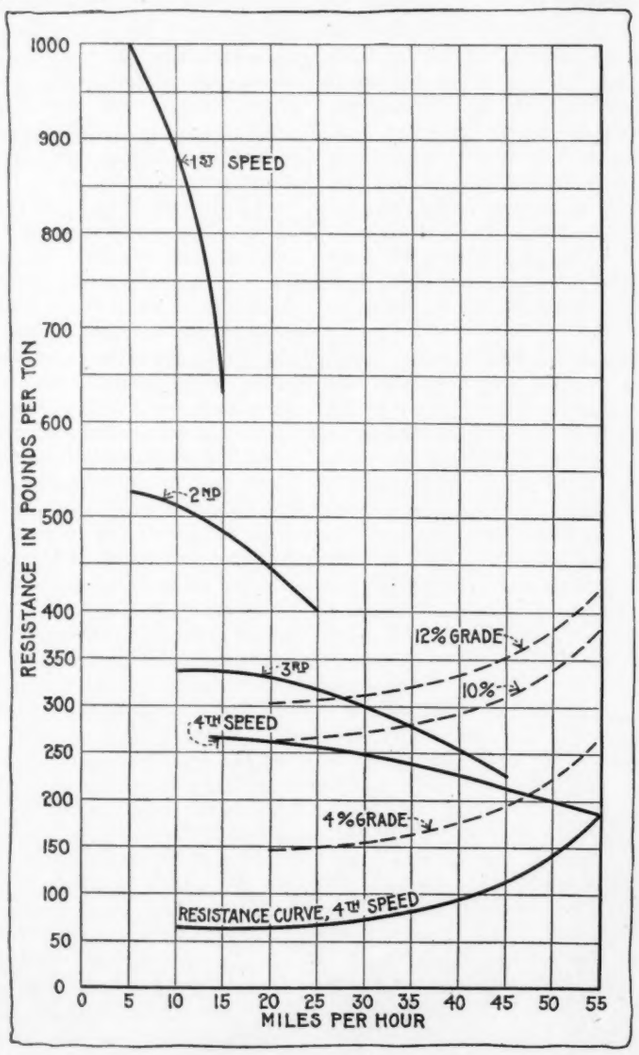


**Fig. 3—This set of curves furnishes the data necessary in plotting the maximum horsepower curves for each speed. Such a curve has been plotted from the data given here and is shown in the curve above (Fig. 2)**

The motor torque curve once plotted can be used to calculate the torque curves on the resistance-miles diagram for third, second and low gear ratios, as previously shown in Fig. 5, Part III.

By drawing in the grade resistance curves we can determine the accelerating power and grade-climbing ability of the car in question.

The author made a test of this character on a 1908 chain-drive car, November 6, 1912. The car weighed 2 tons and did not have a windshield. The tires were 36-inch diameter; gear ratios: first, 9.25; second, 4.65; third, 3.08; fourth, 2.4. Motor, four-cylinder, 5.75 inches by 5.75 inches.

The resistance curve is shown in Fig. 2 (A). As maximum speed was 55 miles per hour, this point was taken on a point on the resistance curve where the torque curve, on fourth speed, crossed it. Another point was taken on the 10 per cent. grade resistance curve at its intersection with the 20-mile ordinate. As given in the curves, Fig. 3. This was determined from the performance of the car, which ascended a 10 per cent. grade at 20 miles per hour, on fourth speed, without being able to accelerate.

Other points on the torque curve were found from the acceleration which could be given to the car at various velocities in miles per hour.

From this torque curve a motor torque curve was plotted, as shown in Fig. 3.

This curve was then used as a basis for obtaining the torque curves of third, second and first speeds, which are shown in Fig. 1.

These curves show the great power which this car has to accelerate when in low gears. The maximum power is 1,000 pounds per ton at 5 miles per hour on first speed.

In all these cases just cited, if the wind should be blowing against the car or if the road becomes rough the resistance, of course, would be increased and the speed shown by the diagram could not be realized.

The engine torque curve can be raised a small amount by opening the muffler, provided the speed is greater than 30 miles per hour.

Some of the possibilities of the accelerometer have been shown in the preceding lines. Now it remains for the car owner to make the above-mentioned experiments and by comparison judge whether his

(*Continued on page* 993)

# The Engineering Digest

## A Digest of Technical Information from the Engineering Journals

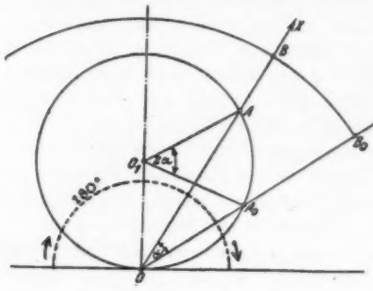

Fig. 1, illustrating the geometrical principle of the Magg system for a graphic presentation of cam and valve action of any given requirements in four-cycle motors—the system enabling the designer to ascertain in advance the effect of any chosen valve-timing or cam shape on other factors of interest

**ASSISTANCE for the Designing and Mounting of Camshafts.**—A graphic method has been devised by Dr.-Engineer J. Magg of the Technical Highschool at Graz, Austria, for co-ordinating the position of the camshaft and the cams with the corresponding position of the crankshaft and piston in a four-cycle motor, the resulting diagrams enabling the designer to visualize requirements and effects with regard to any particular valve-timing or control mechanism which it may be his purpose to incorporate in the motor. Diagrams serving the same purpose have been in use for 50 years for steam engines and have been applicable to two-cycle internal-combustion motors as well, but the corresponding data for four-cycle motors have been in the form of tabulations, difficult to consult and giving no mental advance-image of the relations and shapes to be accomplished.

As the camshaft makes one revolution while the motor shaft makes two, the basis for a diagram system must be sought in a geometrical relation of the same nature. This is found in the fact that a peripheric angle is one-half of the center angle on the same arc. In Fig. 1 the center angle $AO_1A_0$ measures twice as many degrees as the peripheric angle $AOA_0$. Consequently, when the line OX turns to the position $OX_0$ describing the arc $BB_0$, it turns exactly one-half as many degrees as the line $O_1A$ which at the same time turns to the position $O_1A_0$, describing the arc $AA_0$. [Those who have forgotten this geometrical theorem may easily realize the relation by turning a tangent at O around O, so as to intersect the circle successively at all points of its periphery until it points in the opposite direction, having turned 180 degrees, while a radius to the successive points of intersection, by following the movement, describes a full circle or 360 degrees].

A full revolution of OX thus corresponds to two full revolutions of $O_1A$, and there are therefore the same relations between OX and $O_1A$, as between the camshaft and the motor shaft in a four-cycle motor. But if only one circle is used to represent the motor shaft, no distinction will appear in the diagram between induction and power strokes or between compression and exhaust strokes. In the complete cam-action diagram, Fig. 2, the motor shaft and piston movement is therefore represented by two circles placed side by side. $O_1$ and $O_2$ are here the separated centers of the two revolutions of the motor shaft, the line $O_1$ $O_2$ is the piston displacement, and O is the center of the cam-action circle. It is practical to draw the crankshaft circles with a radius of 100 millimeters, as this facilitates all graphic dealing with factors in the valve-timing which are expressed as a percentage of the piston displacement. The radius of the circle representing the cam-action is best shown in a simple numerical relation to the actual eccentricity $e$ of the cam [which in most cases is identical with the number of millimeters of valve-lift]. For the sake of uniformity, the movements expressed in the diagram should always be represented as taking place clockwise, and the exterior intersection Z between the crankshaft circle to the left and the line representing the piston displacement should be taken as the moment of ignition [on center; the retarding or advancement of the spark being a matter not entering for consideration]. The halves of the crankshaft circles will then represent successive strokes in the cycle of the motor in the order marked on Fig. 2. In this illustration there is constructed an opening Aa of the exhaust valve taking place when the expansion or power stroke lacks 15 per cent. of being finished and a closing Az of the same valve 5 per cent. after the end of the exhaust stroke. The arc between Aa and Az represents the angular travel of the exhaust cam while the exhaust valve is open, and the hatched area gives a relative value, as a gas channel, of the valve-lift effected (apart from the effects of a possible lever device with unequal arms for actuating the tappet rods or valve stem). The perpendicular

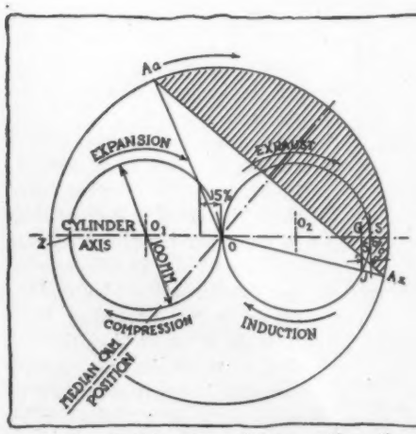


Fig. 2—The plan of cam action diagram

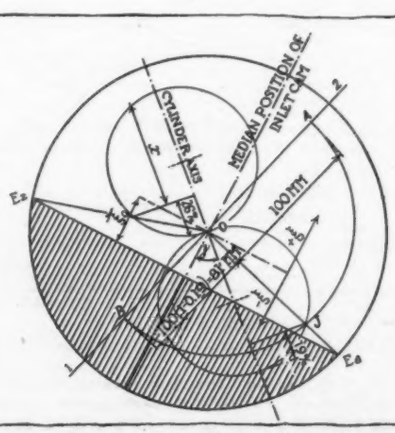


Fig. 3—An example of diagram construction

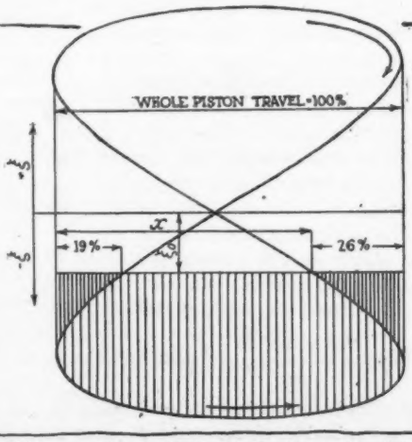


Fig. 4—Determining the valve lift

erected upon the middle of the line Aa-Az determines the median position of the cam during the exhaust.

Three examples of the numerous ways in which this diagram may be used are illustrated in Figs. 3, 4, 5 and 6.

Example 1, Fig. 3. Assumed to be known: The point Ea in the camshaft circle corresponding to the moment of opening the inlet valve; also the point in the piston stroke to which Ea corresponds, this being chosen as 19 per cent. before center, and the piston displacement before the closing, the moment of closing to come 26 per cent. after center. This moment is to be marked Ez on the camshaft circle. To be determined: The median position of the cam during the admission of gas and the relations to the piston travel.

The diagram can be completed from the given values of Ea and Ez by drawing crankshaft circles first and turning them by superposition within the camshaft circle till Ea is in the correct relation, but Fig. 3 shows a direct construction as follows: Draw the line 1-2 perpendicular on Ea-O and mark on it OA equal to the diameter of the crankshaft circle (100 millimeters) and OB equal to the piston travel from the center at O to Ea (in this case 100 millimeters minus 19 per cent., or 81 millimeters). The semi-circle over AB as diameter intersects the straight-line O-Ea at a point J which is now the second point known in the crankshaft circle which is sought. Having O and J, the center of the crankshaft circle can now be determined (being the intersection of a perpendicular on middle of OJ and an arc drawn with radius 50 millimeters from O) and therewith the line of piston travel. Thereafter the point Ez is determined as before, and the perpendicular on the middle of chord Ea-Ez gives the median cam position, while the arc Ea-Ez gives the duration of the admission.

The relation between the cam-lift $\xi$ (xi), measured at the median position, and the corresponding piston displacement x, measured from the dead center, gives a value for $\xi$ (xi) in which the length of the connecting-rod does not enter as a factor but in the form of an equation of the fourth degree:

$$\xi = \pm e\left[\sqrt{\frac{x}{2r}}\sin\gamma \pm \sqrt{1-\frac{x}{2r}}\cos\gamma\right]$$

in which $e$ is the eccentricity, r the crankarm length, $\gamma$ (gamma) the angle between the line of piston displacement (cylinder axis) and the median cam position. To work this equation out is a tedious task, but the diagram shows directly the relations between x and $\xi$ (xi), as indicated in the diagram for the point Ez. When the same relations are drawn in for a large number of points, there is obtained a picture of the open-period of the inlet valve, as in Fig. 4, in which the piston travel is drawn on twice as big a scale as in Fig. 3. If the dimensions of possible rocker-arms or tappet-lift levers are known, a curve designating the valve lift can be drawn directly from such a diagram.

Example 2, Fig. 5: The object being to operate inlet and exhaust valves by means of a single cam, the angle of rotation intervening between the actuating of the two valves is to be determined. Under the circumstances the two valves must remain open equally long, so that three points in the valve action determine the fourth. Thus, if it is given that the opening of the inlet valve is 7 per cent. early (Ea = 7 per cent.), its closing 11 per cent. late (Ez = 11 per cent.) and the opening of the exhaust valve 16 per cent. early (Aa = 16 per cent.), then the position Az for the closing of the exhaust, which is usually most variable, is fixed. In the diagram, Fig. 5, it is found practical to introduce the "inert circle" of the cam in the place of the cam circle. The angle between Ea and Ez, with the opening moments as assumed, measures 125 degrees and must be the same between Aa and Az, whereby Az is determined. From the points Ea and Ez and a chosen valve lift the shape of the cam portion can be constructed. The angle $\phi$ (phi) between the tappet-rod rollers is determined by radial perpendiculars on the chords Aa-Az and Ea-Ez.

Example 3, Fig. 6: [This relates to means for equalizing the action of two symmetrical cam systems in a double-acting four-cycle motor, and as this case is even farther removed from automobile practice than example 2, the details are here omitted and only the diagram is presented. The author has under way a larger work on the valve control of internal-combustion motors, in which the style of diagram here exemplified is employed exclusively for elucidating the subject.]—From *Zeitschrift V. D. I.*, Feb. 15.

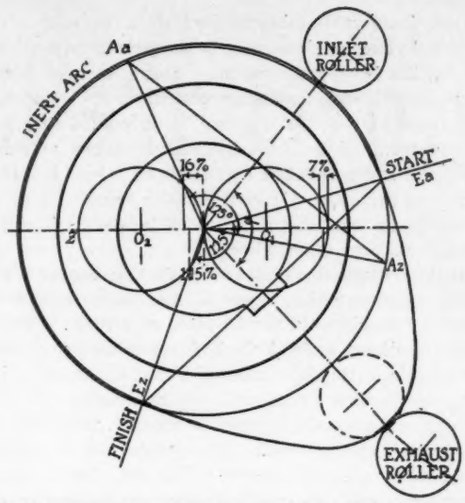


Fig. 5—Diagram for using one cam for inlet and exhaust

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**CONTINUOUS Gear Change.**—The Bardet system for effecting infinitely graduated changes in the ratio of a power transmission depends upon the use of special beehive-shaped slidable gear teeth such as are shown marked *d* in Fig. 7. The system is at present interesting mainly as an example of pretty mechanics. The teeth *d* of the driving-wheel *a* are mounted on sliding-blocks *e* movable transversely of the wheel in grooves *ei*. The driven wheel *b*, on the other hand, has fixed teeth formed on planes radiating from its axis. The shaft *f* of this wheel is stationary, and the shaft *h* of wheel *a* can turn around a third shaft *i* which is perpendicular upon both shaft *f* and shaft *h*.

If wheel *a* is turned parallel with the shaft wheel *b*, as in both the sectional views of Fig. 7, its teeth *d* can all pass successively between two teeth *g* of wheel *b* without causing any rotation of the latter. But if the plane of wheel *a* is turned around shaft *i* into an oblique position, each tooth *d* of *a*, once engaged between two teeth *g* of *b*, will push one of these teeth laterally and will make the wheel *b* turn a certain angle, the size of which depends upon the angle of inclination of wheel *a*.

[It may be considered an objection that the highest gear is thus obtained in the most oblique position of *a*.]

In order to make the engagement possible, the teeth of the driving-wheel are mounted on sliding-blocks which remain movable so long as the tooth on each of them is not in mesh with *b*, and the teeth during that period follow a path determined by a toothed cone *w* which turns in unison with wheel *b* and by a curved guide-piece *c*. This hollow piece is flared at its entrance where it receives the tooth coming out of mesh

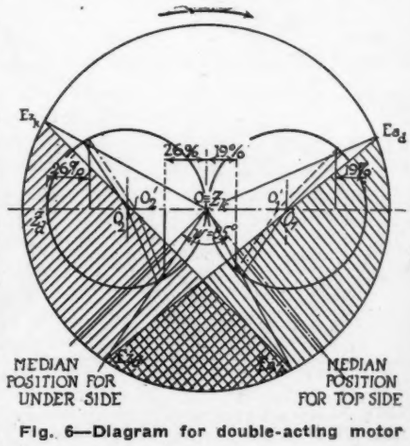


Fig. 6—Diagram for double-acting motor

and narrows down at its other end which is opposite to the apex of the toothed cone *w* whose base is tangent to one of the edges of wheel *b*. The bevel-gear pinions *k* and *y*, secured respectively to cone *w* and wheel *b*, assure the unity of movements by which the teeth of wheel *a* are sure to be guided into the space between two teeth of cone *w*—the sliding-blocks assisting—and thence into the space between two teeth of wheel *b*. The guide *c* is secured to the support *j* in which the spindles *h* of wheel *a* are journaled, so that the guide piece always remains in the median plane vertical upon wheel *a*.

Now, if the wheel *a* is turned a certain angle around the shaft *i*—by means of the worm *u*, the sector *v* and the two bevel pinions *l* and *m*—the guide piece *c* is turned with it, and the cone *w* oscillates around shaft *f*, while its apex remains at the exit of guide *c;* this by virtue of a special manner of mounting shaft *ji* of cone *w* permitting this oscillation.

Steel balls *x* are placed in nests *n* formed in driving-wheel *a* in line with each sliding-block. The bottoms of these nests are slightly inclined toward the middle. The balls, being pushed outwardly by springs *o*, are pinched between the bottoms of the nests and the sliding-blocks, blocking any movement of the latter in either direction. It is necessary to release the blocks in order to bring them back into the central plane of wheel *a* as soon as teeth *d* enter the guide piece *c*. For this purpose, the mechanism includes two plates *p* journaled upon shaft *h* with the intermediation of ball joints *q*. Upon the edges of these plates there are shoulders *r* extending laterally and engaging the entrances to nests *n*. By reason of the position of the plate, which is held inclined at an angle with shaft *h* by the action of the fixed fork *t* upon the lug *s*, in all position except that directly facing wheel *b*, the balls *x* are pushed by the shoulders *r* to the center of the nests, excepting at the moment when a tooth passes before wheel *b*.—From *Technique Automobile* and *Génie Civil*, January 18.

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**STEEL Better and Cheaper.**—According to detailed reports in the metallurgical journals it costs about $1.50 less to produce 100 tons of steel by the Hadfield method than without making use of this improvement. By the Hadfield method the freshly poured ingot is forced to cool and solidify from below up, the top being kept hot longer by means of a layer of charcoal, separated from the molten steel only by a thin layer of non-conductive material, such as slag, and an airblast fomenting the combustion of the charcoal. The saving is materialized solely through the fact that from 15 to 30 per cent. must be cut from the top of the ingot cooled in the ordinary manner by reason of being faulty in structure and composition and must be melted over again, while the discard from the top-heated ingot amounts only to from 8 to 10 per cent. The flaws which are made to concentrate in this small percentage of the steel are checks ramifying from the "pipe," or empty space forming in that part of the ingot which cools last, and segregation. The latter is due to the flow of impurities toward the portion of the ingot which keeps fluid longest. By keeping the top hot, the "pipe" is partly filled from above—or, rather, prevented from forming—while the impurities, such as oxides, nitrides, sulphur and phosphorus, continue to rise.

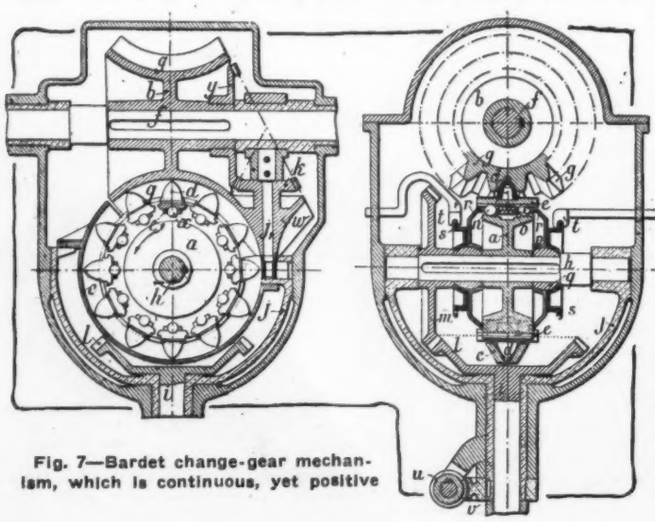

Fig. 7—Bardet change-gear mechanism, which is continuous, yet positive

Of greater importance to the automobile industry than the saving in the cost of production of plain carbon steel is the much greater saving effected in the case of alloy steels, their value being higher and their discard being relatively of lower value for remelting purposes. But far beyond even this consideration comes another which has not yet become widely appreciated, although it is strongly emphasized by Hadfield. It is this, that the strong flow of impurities toward the top-heated portion, which is discarded in the end, leaves the usable portion of the ingot—the 90 to 92 per cent.—perfectly sound and uniform in structure, while the 70 to 80 per cent. which is used of ingots cooled in the ordinary manner still frequently contains faulty streaks of steel that pass undetected until taken into use. These minor flaws, which are after all far from negligible, especially for automobile purposes, are caused by irregularities in the process of the cooling and solidification, the steel in which they are found having remained hot while imprisoned in cooler and impervious surrounding portions of the whole mass, so that the flow of impurities toward the eventual discard-portion was barred and the steel in the hot pocket was compelled to contract separately in the final cooling under strains likely to cause a local "pipe" or a fissure.

From another source there comes a guarantee of better and cheaper steel than that which has been available in the past. The electric steel furnaces and melting-ovens are multiplying and offer industrial facilities for producing at a relatively low cost steels in which a desired chemical composition is maintained with an accuracy scarcely to be equalled by the much more expensive crucible-method of production. It is perhaps especially notable that the carbon content of electric-smelted steel can be warranted to come within 5 points (1 point being 1 per cent. of 1 per cent.) of that specified in advance, while a tolerance of 10 points, or even 15, has been considered unavoidable in the case of open-hearth steel. A still more far-reaching importance is attributed to the fact that steel can be maintained at a very high temperature and degree of fluidity in an electric oven or tip-furnace and, when poured from it directly into moulds, can be made to assume shapes so thin and intricate that similar ones never could have been contemplated heretofore for steel castings. And as the chemical composition of the electric steel is also under excellent control, as mentioned, the strength and toughness of such castings can be made highly creditable. In conjunction with recent progress in the art of producing and handling the moulds and cores by special machinery, the electric furnace renders a rapid expansion in the casting of automobile parts distinctly probable, the development in this direction being already well under way and limited in its immediate possibilities only by the necessary slowness in the installation of furnaces and in the acquirement of the new technical knowledge which must be brought to bear upon the work.—From *Revue de Métallurgie, Giesserei Zeitung, Järnkontorets Annaler* and other journals.

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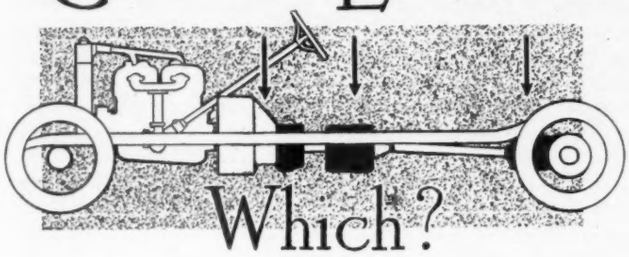
**DIFFERENCE in Motoring Temperaments of Nations.**—According to statistics presented by Prince Henry of Prussia, there are 88,279 motor vehicles in circulation in France with a population of about 38 millions, making 441 persons to each vehicle, while in Great Britain there are 175,245 vehicles for a population of 43,740,000, or one vehicle for 249 persons. Germany, on the other hand, with 75 million inhabitants, has only 70,000 motor vehicles, or one for 927 persons. The figures include motorcycles. Whether the explanation of the disproportion for Germany is to be sought in the lesser popular wealth, in prejudices not yet overcome or in the too-high taxation of the German automobiles, seems difficult to decide.—From *Z. V. D. I.*

# The Engineers' Forum

## Gearbox Location



## Which?

### Part II

### Amidship Location Is Favorite with Three Engineers—Two Prefer Unit with Motor Construction

*Keeton Prefers Location Amidship*
*Maraini Also Likes Amidship Type*
*Crane Finds Conditions Determine*
*Porter Approves a Unit with Motor*
*Gilliard Leans Toward Amidship Idea*
*Lee Likes the Unit with the Motor*

HEREWITH appears the second installment of the views expressed by leading automobile engineers on the subject of gearbox location, the discussion of which was caused by the article by S. D. Waldon, "The Rear Axle Gearbox," in THE AUTOMOBILE for April 17. The ideas of several men prominent in the automobile field follow:

¶ *Weight Distribution Is Most Important—Keeton*

DETROIT, MICH.—Editor THE AUTOMOBILE:—With reference to location of gearbox, in the first place, the question of distribution of weight is a most important factor. After considerable experimenting and observation, we found that locating the gearbox amidship in a car of the weight of 3,400 pounds, completely equipped and all tanks full, makes for easier riding than when located as a unit with the motor or with the rear axle. And, by this practice, we distribute the weight as evenly as is possible in an automobile so that an undue proportion is not put on the front axle or on the rear axle. **Further, the distribution of weight, as in our car, to some extent lessens the liability of skidding,** which, as you will agree, is a most important point to carefully consider. Then there is the question of accessibility. It takes but a fraction of a minute to remove the footboards in the car, and the gearbox complete is exposed, ready for oiling, adjustment, or, in fact, whatever work is necessary to be done. If the gearbox was located as an integral unit with the rear axle, it would mean removing the body entirely in order to make simple adjustments, or else assuming a very uncomfortable position beneath the car in order to put oil into the transmission. And if located as an integral unit with the motor, it would be necessary to remove at least the front footboards for oiling, and if adjustments were necessary, the body and radiator as well. **The location of the gearbox as an integral unit with the motor, in our type of car especially, would make the clutch practically inaccessible even for the ordinary oiling.**

The demand of the critical motor-buying public of today is for simplicity with the greatest possible efficiency, and in locating the gearbox as we do, with left-hand steering and center control, changes from first to fourth speed and to reverse being made by one lever extending directly upwards from the gearbox, we completely eliminate pull-rods with their adjustments, etc., which gives us a clean chassis and at the same time makes for easier gear changing. Just one more vital fact—locating the gearbox as we do makes it serve as a cross-member, strengthening the frame and eliminating the two cross-members ordinarily used when other methods of locating the transmission are followed.—F. M. KEETON, Vice-president and Manager, Keeton Motor Co.

¶ *Best Type Depends on Size of the Car—Maraini*

POUGHKEEPSIE, N. Y.—Editor THE AUTOMOBILE:—Gearset as a unit with the rear axle: Differential and main driving bevel or worm gears, and occasionally brake control, are enough for a rear axle to carry. Any other mechanism added to these, besides spoiling its simplicity and neat appearance, increases its weight; and the rear axle better than any other part of the car should be as light as possible. For this simple reason I believe there is no advantage in making the gearbox a unit with the rear axle.

Gearset as a unit with the motor: For a car not high-powered a neat unit with a short three-speed gearset is preferable under every point of view, say, lightness, rigidity and simplicity, and this especially if combined with a well-designed three-point suspension, so as to relieve the system from any stress or distortion. I am very favorable to this style of construction limited to a certain limit of power.

Gearset mounted amidship: For a big motor with a large clutch, four-speed gearset, the unit system, though not absolutely objectionable, is apt to lose the main qualities of lightness and neatness above mentioned, so that in a high-powered heavy car I prefer to have the gearbox mounted amidship. This allowing also the discharge directly on the frame, through the cross-bar, the heavy stress and distortion transmitted by the rear system.—B. MARAINI, Engineer, Fiat Automobile Co.

¶ *Roads Too Rough for Axle Type—Crane*

BAYONNE, N. J.—Editor THE AUTOMOBILE:—The proper position of the gearbox whether it should be combined with the rear axle or with the engine, or mounted separately in the center of the car is a complicated one involving many opposing considerations. **So long as the roads in this country are no better than they are, I do not think that the extra weight below the springs on the rear axle caused by placing the gearbox there can be justified.** This is a serious matter with a three-speed gearbox and naturally much more serious with a four-speed gearbox. I believe that it is admitted by all engineers that the axles both front and rear of a car, as well as the wheels should be as light as they can possibly be made if the easiest riding car over all kinds of roads is to be obtained and if the tire wear is to be reduced to a minimum.

**The chief advantage of the gearbox on the rear axle is its power first cost and the possibly slightly lower cost of upkeep of the propeller shaft and joints.** In view of the fact

that most cars are driven 99 per cent. of the time on the high gears the latter advantage cannot be expected to be noticeable, and would never compare except in a case of cars driven at very low speeds with the excess tire wear and consequent expense due to the extra weight below the springs. **This form of mounting also prevents the use of a propeller shaft brake, which, when properly designed, is far more powerful, equally smooth in operation, easier to adjust and less liable to need adjustment due to its being completely protected against dirt, as well as much more efficient on slippery roads, presenting as it does an equal retarding effect on both wheels than the brakes mounted directly on the rear wheels.**

As to whether the gearbox should be combined with the engine or mounted separately in the center of the car depends somewhat on the size of the power plant. The combination system is simpler from a manufacturing point of view and affords better protection against dirt, although it frequently makes certain parts somewhat inaccessible.

As the design and construction of clutches especially and of other parts becomes more reliable, the relative importance of accessibility becomes less, and the advantages of the unit power plant more marked.

In our own cars combining a six-cylinder engine of rather large size and a four-speed gearbox with gearbox brake the size and weight of the parts and the element of accessibility decided in favor of the separate gearbox.—H. M. CRANE, President, Crane Motor Car Co.

### ¶ *Unit with Motor for Small Cars—Porter*

TRENTON, N. J.—Editor THE AUTOMOBILE:—The discussion opened in the April 17 issue of your paper in reference to the mounting of gearchange set is one that will present many varied and opposite opinions. The position taken in this issue by S. D. Waldon, of the Packard company, to my mind, evades the paramount issues concerned in the relative values of the different methods used. He seems to have neglected the fact that **the suspended part of a car's weight is to the car as a whole under speed conditions, the same as the flywheel is to the motor. This coupled with the fact that unnecessary weight is undesirable is the one never-failing fact that faces every designer who attempts the rear-axle gearbox.**

These are things that are not the question of different men's opinions or judgment, or the interpretation of the laws governing these things, but are facts that have been illustrated from time to time by tests and conceded, I believe, by nearly every one. Mr. Waldon had ignored this entirely and seems to lay great stress on the easy-riding qualities of inclosed cars with this type of construction. The easy-riding qualities mentioned cannot be disputed, but the realization of this condition is not the rear axle unit. I merely take sides with Mr. Waldon on these points to illustrate why I believe the rear axle unit to be out of the question in so far as a fast-moving vehicle is concerned.

**The unit construction I believe to be without question the only thing for cars developing less than 30 horsepower,** owing to the length of the unit usually involved with motors developing greater horsepower in order to take care of the increased torque makes necessary such a cumbersome and rigid construction that the practice resolves itself into a very roundabout way of reaching the desired object. Since three-point construction is almost necessary with this type of unit, this then leads to the sub-frame construction for the medium and heavy-weight cars. The theoretical ideal, of course, points to unit construction with three-point suspension, but in practice the obstacles are many. The success of subframe construction depends largely on the placing of the gusset and the section of the subframe member. The subframe must necessarily be as narrow as possible and so placed that the result of the main frame warping is not conveyed to the subframe members in an exaggerated proportion. The misalignment under these conditions occasioned at the point between the gearset and the motor, due to the twisting of the main frame, becomes so very slight that it is easily taken care of in a permanent manner by the compensating joint at this point.

### *It Is Up to the Designer*

Since this is about the only argument against subframe construction it behooves the designer using this type to so locate the compensating joint in relation to the feet of the motor and gearset that any possible misalignment of the subframe is transmitted to the two separate units in a very nearly like ratio, which will reduce the misalignment between the two units to a minimum. Subframe construction also lends itself to economical production and the compensating joint proves of considerable value in taking care of the variation in frame dimensions as well as relieves the necessity of being too accurate on the feet of the different units.

The question of excess weight with this construction can be neglected inasmuch as cases often cited in arguments are not the result of subframe construction, but more often lack of thorough understanding exhibited by the designer of different units. This construction also lends itself readily to the perfect alignment of driveshaft, universals, torque rods and radius rods. Without resorting to unduly heavy construction, it practically eliminates all end movement of the universal joint excepting in the case of one wheel being raised and the other stationary. This point alone proves of wonderful value in the maintenance of these parts and relieves to a great extent the usual shock transmitted by a hard jolt often experienced in the other types of construction.

Summing up briefly the subframe construction in the hands of one thoroughly conversant with the desirable points to be attained develops many of the ideal values sought after and more nearly approaches them as a whole than any other class of construction.

Mr. Waldon's reference to class of material and workmanship used in the rear construction permitting of lightness, together with his remarks in reference to accessibility of the clutch, are also points that have no bearing on the type of construction. The same argument holds good for all types and becomes merely a matter of the designer's ability and the standard set for attainment.—FINLEY R. PORTER, Engineer, Mercer Automobile Co.

### ¶ *Amidship Is Very Advantageous—Gilliard*

YORK, PA.—Editor THE AUTOMOBILE:—In looking over the different ways of mounting the motor, gearset and rear axle in motor cars, it will be found that the size of the car itself is of predominating importance, and one system, although successful with a small car, could not be very well applied with the same results to a larger car.

Readers of THE AUTOMOBILE will find outlined below our criticisms of the three principal modes of construction, with their qualities and defects, which 15 years of experience in the automobile field in America and abroad have allowed us to learn.

The writer will incidentally state that he was connected from 1895 to 1902 with the Motobloc Co. of France, which was the first abroad to introduce a unit power plant system, motor and gearset combined, with the clutch running in oil. This was in 1895.

Gearset as unit with motor: Good points: neat in appearance, cheap as a manufacturing proposition.

Bad points: weight of gearbox carried on front axle too much, this system necessarily being of the inclosed type, the disadvantage of inaccessibility presents ieself. Unit systems of this design are heavy, meaning unnecessary weight to be carried by tires and less hill-climbing ability; driveshaft of gearset and crankshaft of engine being constructed in a rigid line, and the bearings of the crankshaft being generally

split babbitt, while the gearset bearings are ball bearings, the wear of the crankshaft bearings being mostly in a direction perpendicular to the axis of the shaft, and the radial wear of ball bearings is practically nil, it will be clearly seen that undue stresses resulting from disalignment will be created even under the most normal conditions of wear.

Unless power plants below 25 horsepower and three speeds forward are produced, the problem of attaching the unit to the frame becomes difficult on account of its length and weight.

Gearset as unit with rear axle: Good points: Minimum strains on rear universal joints; saving in manufacturing; gearset not rigidly fastened to frame, minimizing gear noise.

Bad points: Too much unsprung weight on rear wheels, giving bad riding conditions and excessive wear on tires; abnormal length of change-speed control rods; position of gears in gear case affected by the accidental change of position of rear axle in relation to rear springs.

Gearset amidship: Bad points: More expensive as a manufacturing proposition and one more set of universal joints.

Good points: Access of parts maximum; repair and replacements facilitated and cars not in repair shops long; no side strains on engine or transmission; small units to handle in shop; direct-acting gear-shifting rods, as gearbox comes under floor, naturally in the right position, and weight uniformly distributed on frame.—E. T. GILLIARD, General Manager, Pullman Motor Car Co.

### ¶ *Unit with Motor Is Most Simple—Lee*

DETROIT, MICH.—Editor THE AUTOMOBILE:—Since the inception of the motor car, opinions as to the locations of its different components have been various. In the past the motor and gearbox were located anywhere between the front and rear axle, and it is safe to say that the present predominating locations have been more the result of public opinion than from engineers carrying out what they frankly believed to be the more practical. However, as engineers are more or less adaptable they accomplish a great deal even though they are not privileged to carry out their own pet ideas.

Not long ago there was a car made with the motor and gearbox located very close to the rear axle. This left the front end of the car lighter and gave it the advantages of being able to climb obstructions in the road and contributed to easier steering, not to mention the added traction to the rear wheels. On account of this construction it is safe to say, and there are those who can bear witness, that for ability to get around over any kind of roads there was nothing, that could compare with it, having the same amount of power.

However, in the meantime there were many other cars designed with the motor under a hood in front which, while it occupied much valuable space, proved to be more accessible and pleasing to the general public. It also has its advantages which are well known, such as being more accessible for carbureter adjustments and minor troubles. The gearbox was still a matter of opinion as to its location and is to this time. However, at present it has three principal locations; that of the rear axle, mounted separately between the motor and rear axle, and the unit construction now employed by many makers of well-known ability.

The writer, being an advocate of the unit construction, will, therefore, pass up the others, and while the arguments will be drawn from our own car it is for the purpose of illustration only. As before mentioned, the advantage in placing the motor in front under a hood was to make it more accessible for correcting troubles, and in order that they may be more readily detected. This being the case, it is evident that the gearbox and clutch could be incorporated with the motor as a unit for the same purpose. No doubt this was the intention of the designer of the first unit constructed power plant, but which, however, does not cover all of the advantages. By this construction it is possible to design the motor, gearbox and clutch so that they cannot be distorted by road conditions. Once they are right there is nothing aside from completely demolishing a car that can disturb them and even then they have been found to be as good as ever. They are there to stay. Especially is this the case when the three units are suspended at three points. It also lends itself very readily to the new and popular center control as the mechanisms can be incorporated in the gearbox cover and directly connected without the necessary linkage and reach rods that are usually found on the cars of other designs. There are few possibilities for oil leaks and dirt may be more readily excluded, as the only moving parts which project outside of the case are protected by the sod pan beneath the motor.

### *Engineers Working Toward Simplicity*

Up-to-date engineers are continually working to make cars simpler of construction and operation. In some cases it is necessary for an owner to keep a couple of barrels of oil and from 50 to 100 or more pounds of different kinds of grease, and a chauffeur who must be an expert mechanic. This may suit the man who can afford this extra expense, but for the average owner who drives and looks after his own car, the simpler and fewer the duties he has to perform before the car may be operated the better he likes it. This is where the unit construction again has its advantages.

In the case of our car it is only necessary to pour the oil through the breather pipe, which is made especially large for this purpose, until it shows the proper level on the gauge and the motor, clutch and gearbox are oiled. After the motor has run long enough to collect cuttings all that is necessary to remove them is to drain the oil out at the point lowest in the oil receptacle, pour in a gallon of kerosene, and run the motor 5 seconds, after which the kerosene may be drained off, and the oil receptacle refilled with clean oil. As far as accessibility goes it is possible to take the motor out of the frame, gearbox and all, and replace in an hour's time. Again the gearbox and clutch can be detached from the motor and disassembled, put back and reattached in 30 minutes, all without removing anything but the hood and the floor boards in front. In our construction there is absolutely no end thrust taken by the motor or gearset. The driving of the car is not transmitted from the rear axle to the gearbox as in some cases, but is accomplished by means of specially designed cross-member to which the axle torque arm is attached by means of a ball-and-socket joint, which leaves the gearbox and motor free from any duties save imparting the rotary motion to the rear axle. This construction also permits of supporting the gearbox high enough to clear all obstructions in the road and it cannot be affected by vibrations due to the rear wheels, or subjected to any driving strain or torque from the rear axle. In motor cars as well as in all other progressive lines of business, evolution is a factor always to be considered, and in using the unit constructed motor and gearbox we are only taking advantage of what long well-founded experiences have proved to be most desirable.—W. S. LEE, Engineer Briggs Detroiter Co.

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BOSTON, MASS.—Editor THE AUTOMOBILE:—The point that seems uppermost in my mind is in regard to the power developed at the various speeds allowed by law, which, as you state, is, of course, a great deal below the maximum horsepower of the motor. It seems as though if the automobiles were allowed only 25 miles per hour as a maximum speed, the horsepower developed at that speed being approximately 12-15 horsepower, that it would most certainly be unfair to tax the owner for something that he had but was not allowed to use. If the owner is allowed to drive his car at its full rated power, then, of course, it would be no more than right that he should be obliged to pay in proportion.

At the present writing this is the only point that the writer could see that would have any effect on stalling this new legislation.—C. T. BATES, Lenox Motor Car Co., Inc.

# Inspection Report Blanks

## Truck Form, Passenger Car Test Card and File Index Key Card Used in New York Service Plants

### New Type of Requisition Designed for Work Shops on the Card and Punch-Tag Scheme

IN ADDITION to the several series of automobile inspection blanks which have been illustrated and the use of which has been described in previous issues of THE AUTOMOBILE, a few additional blanks in use with several companies of New York are shown below.

The first of these forms, Fig. 1, is a report which is made out by the truck inspectors of the General Motors Truck Co., of New York. This company arranges with GMC trucks operating in the Metropolitan territory for monthly calls at the service department garage, during which inspectors look over the exterior parts of the trucks which are apt to get out of adjustment. Once every 3 months, the inspectors open the crankcase and gearbox of every truck to see if the internal parts are in good condition, whether or not the bearings need taking up, if the gears are properly lubricated, etc. In this way, a thorough inspection is made of the whole truck and by applying the principle of a stitch in time saving nine, the life of the truck is lengthened and the cost of maintenance per year and mile reduced. In such cases where it is impossible for a truck to call at the department, the latter sends inspectors to meet the truck at a pre-arranged time and place, to make as thorough an inspection as possible.

After the inspection has been completed, the inspector fills out a report, Fig. 1. The paper on which this report blank is printed, is 8.5 inches wide, 22 inches high and folded across to form two

No.____ G. M. T. Co. Date____ 191

**INSPECTOR'S REPORT**

G. M. C.____ TON TRUCK NO. OWNER'S NAME____

Arrived at____ (STREET) (Hour)____

Inspection completed at (Hour)____

CONDITION OF CHASSIS NO.____ MODEL____

| MOTOR No.____ | | |
|---|---|---|
| Water outlet system tight | | Frame |
| Water inlet system tight | | |
| Intake manifold nuts tight | | Frame rivets |
| Carburetor flanges nuts tight | | Clutch |
| Exhaust manifold nuts tight | | |
| Water manifold outlets nuts tight | | Drive shaft |
| Water inlet manifold nuts tight | | Transmission |
| Motor bolts to frame tight | | |
| Nuts on main bearing tight | | Differential |
| Nuts on lower crank case tight | | |
| Spark plugs | | J. S. Sprockets |
| Connection to throttle adjusted | | Rear Sprockets |
| Connection to coil tight | | Steering gear, rods, etc. |
| Connections to batteries correct | | Radiator |
| Wiring to timer correct | | Control levers |
| Governor | | Gasoline tank and connections |
| Magneto | | Seat and seat support and shutters |
| Magneto cables | | Lamps |
| Odometer reading | | Pedals |
| Carburetor | | Radius rods |
| | | Chains |
| Compressions | | Springs, front |
| | | " rear |
| Rod bearings | | Wheel bearings |
| Oil system | | Hub caps |

| CONDITION OF TIRES AND RIMS | CONDITION OF BODY |
|---|---|
| Right front tire | Floor |
| Left " " | Sides |
| Right rear " outside | Top |
| " " " inside | Curtains |
| Left " " outside | |
| " " " inside | |

Fig. 1—General Motors truck inspection blank

| OWNER | | | | | | |
|---|---|---|---|---|---|---|
| ADDRESS | | | | N. C. ORDER | | |
| PHONE | | | | MOTOR NO. | | |
| BUSINESS | | | | MODEL | | |
| SOLD BY | | | | DEL'V'D | | |
| ADDRESS | | | | | | |
| PHONE | | | | | | |
| DATE | R. O. | CHARGE AMOUNT | NO CHARGE AMOUNT | TEST OR TUNE UP | | |
| | | | | | | |

Fig. 2—Cadillac service department history card

pages of half that height. On the first, spaces are provided for the name of the truck owner, the place and time of the inspection as well as three sets of smaller spaces for reporting on the condition of the chassis, the tires and the body. The parts named on the sheet are inspected one by one, and in each case a note is made, if there is anything wrong with it. On the second page is a space for owner's or driver's remarks or complaints.

The Cadillac Motor Car Co.'s New York branch does not send inspectors periodically after the cars operating in the territory, but instead any Cadillac car driving up before the service department is readily looked over by the three testers whom the company employs for this purpose. If an inspection is made, the tester goes over the motor, its parts and conjointly operating systems such as lubrication, ignition and carburetion, and then looks over the running gear, etc. As his inspection progresses, he either checks the names of the parts on the blank, Fig. 4, if they are in good order, or states whatever troubles there are. This form is 4.75 by 10.75 inches and is made out with an original on white and a duplicate on yellow paper. After this form has been filled out, it is marked with the name of the car owner, the date of the test, the model name or number of the car and the number of the motor. The report is shown to the owner or driver, and if repairs are ordered by him, the order of the shop or job number is also noted on the form. The original remains in the office of the service department superintendent, while the duplicate is sent to the shop with the job order. All test reports are filed under the engine numbers, the salesroom being in possession of a cross index giving these and the owners' names.

The service department also keeps an exact history of the life of each Cadillac car sold and serving in the New York territory. This work is done by means of file cards, Fig. 2, which are 5 by 8 inches and printed black on thin white cardboard. When the car is sold, the upper half of the card is filled out, giving all possible information about the purchaser and the car itself. Then, whenever the car is brought in for a test or repair job, the date, the eventual repair number and the amounts of paid-for and guarantee work are noted on the card. These cards are filed under the names of the car owners and serve as a key to the inspection and repair record system which latter is too elaborate to be described here at this time.

## Handy Stockroom Requisition

A requisition form used for drawing material from the stockroom which is used by a New York service department is shown in Fig. 3. This form is quite original in the following respect. Ordinarily, requisitions are printed on thin paper in form of

Date_____ No. **519** Job.... O Rq. **519** Job....

## REQUISITION

| Part No. | Quantity | Name of Part | List Unit | List Cost, Total | C | F |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |
| | | | | | | |
| | | | | | | |

| Quantity | Part No. | List Total | C | F |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Received** _____ **O.K.** _____ **Received** _____ _____ **Clerk**

Fig. 3—Novel type of requisition which consists of a main section for the stockroom and a tag attached to the steering wheel

pads and are made out with duplicates and sometimes triplicates, one copy going to the stockroom, a duplicate to the main office and the eventual triplicate to the accountant of the company. A handier system is obtained by the use of the requisition, Fig. 3.

This form is of the size here shown and printed on medium-heavy tan or green cardboard. The right-hand fourth of the card forms a section being divided from the rest of the card by a perforation so that it can be torn off easily; it is punched with a hole so that it can be tied to the steering wheel. The main section which fills three-fourths of the card, is divided into spaces for making a note of the number and quantity of the parts to be drawn from stock, the list price per unit, the total list price which is to be charged to the customer as well as the total cost appearing on the company's books. Sometimes, when material has to be bought outside, the price paid for it is noted under cost. By checking each item under either C or F, the bookkeeper is informed whether the job is to be charged or is done free of charge under the guarantee. Each form is of course numbered on both sections.

In filling out, the workman requiring the card takes one of the cards which are kept on the desk of the foreman and fills out on it the job number, the date, the number and name of the part and the quantity required. The foreman then O.K.'s the requisition by signing it, not until after he has marked each item for charge or free work. Then the workman takes the card to the stockroom, or sends it in by a boy. The latter receives from the stockroom clerk the required material and signs for it on the main section; then the clerk fills out the small section at the right of the card and signs it, as does the recipient of the material. The clerk also marks the items free or charge and if any of the materials are not in stock, he corrects the amount on the requisition. The materials delivered, the clerk retains the main section of the card, while the person who takes the materials to the shop attaches the small section of the card to the steering wheel of the car. When the repair job is completed, the requisitions found on the steering wheel, together with the time-distribution cards of the workers, give full information regarding the cost of a repair job and what should be charged for it.

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## Practical Value of Service Systems

Many a dealer, especially if his business is small, is of the opinion that service systems, which include car inspection and repairs done at the lowest possible price and without profit, are work that does not pay and consequently cannot be done to any purpose. The fallacy of this idea, however, is shown by the fact that large firms with whom economy of practice has become a byword are more and more introducing such apparently unprofitable systems; and that the moral effect on an automobile buyer is greater than one might think. Heretofore, salesmen have sold cars and made not unfrequently statements and claims for their wares and the guarantee these bore, which could not be borne out by practical work. The public has begun to understand, now, however, that expectations of service by automobile makers and dealers must be reasonable and that a guarantee must necessarily be a flexible matter. This brings up the great desirability of keeping the car out of the repair shop as much as possible; but not by running along until it breaks down for good, but to have it inspected frequently and by making small repairs when trouble is still embryonic anticipate bigger ones thereby save in maintenance cost and depreciation of the car.

**DETROIT-CADILLAC MOTOR CAR CO.**

## TESTERS REPORT

FIRST TEST BY

| OWNERS NAME | | DATE |
|---|---|---|
| | | |
| **MODEL** | **ENGINE NUMBER** | **JOB NO** |
| | | |

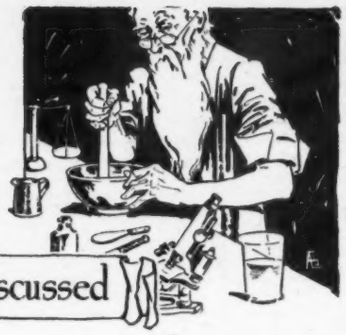
MOTOR.....
CONNECTING RODS.....
WRIST PINS.....
VALVES.....
CYLINDERS.....
MAGNETO.....
PAN AND BEARINGS.....

BONNET AND FASTENINGS.....
ENGINE PAN.....
GASOLINE TANK AND CONNECTIONS.....
MUFFLER AND CUT OUT.....
MUD GUARDS.....

PASSED BY.....

Fig. 4—Test report used by Cadillac Inspectors

# The Rostrum



In which Letters from Readers are Answered and Discussed

## Knock Develops After Overhauling—Lubrication of the Jackson 59—How To Wire Up a Splitdorf Coil—Repairing a Leaky Radiator—Air Pressure on Account of Car Weight—Derivation of S.A.E. Horsepower

### Knocks After Overhauling Job

EDITOR THE AUTOMOBILE:—I am driving a car having a four-cylinder motor, 4.5 by 5 inches, rated at 40 horsepower. The motor has lately been overhauled, all slack taken out, carbon cleaned out, and is apparently in good order, yet the motor knocks badly when accelerated, will not stand a quick opening of the throttle without knocking at any speed it may be running, but will attain maximum speed exceeding 50 miles an hour. The compression is good. In fact, it is difficult or rather impossible to spin the motor when cranking and yet it turns easy with petcocks open. I have tried all degrees of spark advance. Has Zenith carbureter, which, as you know, is not adjustable.

New York City. W. M. WEBB.

—There are two possible causes for this trouble. One is that the compression has been increased an undue amount owing to the reboring of the cylinders and the other, and most probable, is that a piston slap has developed. Twice in every revolution the thrust of the piston against the cylinder wall is transferred to the opposite side. When looseness exists between the piston and the cylinder the skirt of the piston has a tendency to strike the cylinder and give rise to a knock which has come to be known as the piston slap. The only cure for this is the re-boring of the cylinder or the fitting of an oversized piston. The piston has a tendency to swing about the wristpin as a pivot. This produces the condition of affairs which is shown in an exaggerated form in Fig. 1. Before taking steps to prevent the piston slap, which will be a costly operation, be sure that the connecting-rod bearing caps have been tightly fitted, that there is no play in the crankshaft bearings or at the wristpin, that the ignition is properly timed and not advanced too far, that the motor is free of all carbon, and that the valves seat correctly.

### Shoe Has Been Made Too Large

Editor THE AUTOMOBILE:—I have a Ford touring car, and am having trouble with the rear shoe, which is a 30 by 3.5. It keeps slipping off the rim. It has run about 500 miles, and I have been unable to find a remedy up to the present time. Do you know a remedy for such a difficulty?

Lawrence, Mass. GEORGE W. LEDUKE.

—The fault is in the shoe, which has been made too large. The 30 by 3.5-inch size is the correct tire to put on the rear wheels. The best course to pursue would be to take the tire back where you bought it and complain of its oversize. There is a possibility that they have given you a 30 by 4-inch tire by mistake.

You may remember when the tire was last put on whether it slipped on more readily than is usual with tires of the correct size. If this was the case it is proof of the fact that the tire is too large and should be exchanged for one of the correct size.

### Resurfacing a Scored Crankshaft

Editor THE AUTOMOBILE:—Where can I secure a tool for truing up scored crankshafts? I have been doing this on a lathe, but find that it is hard, sometimes, on marine engine shafts when the flywheel has become firmly rusted to the shaft and it is not desired that the time be taken to remove it.

I understand that a tool is made to do this work and that it is adjustable and works on the same principle as a common pipe-cutter, only with the blade running the other way and acting as a scraper or cutter. Can you enlighten me on the subject?

Edgartown, Mass. WILLIAM S. NEVIN.

—THE AUTOMOBILE has no record of any instrument for turning down a scored crankshaft other than a lathe. In practice it would seldom happen that the time required in removing a stubborn flywheel would ever be so great that it would counterbalance that required for turning down the shaft in some other manner. An expert mechanic could, if necessary, take off the extra material by means of a light file and get the work accurate by means of the frequent use of a micrometer. This would be very delicate work and would naturally require a long time on account of the necessity of proceeding carefully and of avoiding the possibility of getting the shaft out of round. After doing this work independently for each bearing it would be necessary to fit each bearing liner very carefully. The bearings would vary in size to a much greater extent than they do when a lathe is used. Even in the latter case there is a variation which sometimes amounts to as much as .005 inch. This amount is made up by scraping in the bearing, or in other instances by shimming. Should the shaft be somewhat out of round or dented it is put in a lathe and a tool which contains an aperture for the shaft lined with very fine emery is put on and the shaft brought back to round. The shaft is never touched by a file where good work is done.

### Lubrication of the Jackson Car

Editor THE AUTOMOBILE:—Will you kindly give me an outline of the oiling system used in the 1912 Jackson 50? Is it a force or splash system?

Bridgeport, Conn. G. C. B.

—The oiling system on the Jackson car is a circulating splash system. The circulation of the oil is maintained by means of the flywheel and by gravity. The oil reservoir is contained in the clutch or flywheel housing, the main oil supply resting in the bottom of this housing. The oil is picked up by the flywheel and carried up to a device known as a skimmer which catches up the oil carried up by the flywheel. This skimmer forms a small vessel which constantly holds a supply of oil.

The oil from the skimmer flows by gravity to a splash trough located beneath each of the connecting-rods and also flows by the same means through another pipe to the gearset. Thus,

there are two oil leads from the skimmer vessel, one a large pipe which takes the oil to the crankcase and the other a smaller one which takes the oil to the gearset. The pipe which leads to the crankcase is pierced by four smaller pipes which grade in size from the rear cylinder to the foremost. The reason for this is the fact that there will be less oil left in the large pipe after each cylinder is passed and therefore, to make the supply of oil even to each one of the cylinders, the oil is divided correctly by the various sizes of pipe. The areas of these pipes have been obtained by calculations and subsequent experiment.

The splash troughs are divided off from one another by walls which are pierced by overflow holes. The holes are of such a height that the oil level is maintained at the right point. Before it can become high enough to cause an over-supply of oil to be thrown up to the cylinders, it will flow down through the overflow holes. The walls between the splash compartments are put there to prevent the oil from leaving the compartments when the car is ascending or descending a steep hill. This would starve either the rear or front cylinders of their oil supply.

As there is constantly much more than the necessary quantity of oil being fed to the skimmer there is always an overflow at this point as well as at the splash troughs and in the gearset housing. All the overflow oil goes back to the well beneath the flywheel, from which it is again picked up and distributed through the system. All the bearings are lubricated by this system without the aid of an oil pump.

## Some Electric Ignition Queries

Editor THE AUTOMOBILE:—Kindly answer the following questions:

1—How to wire master vibrator using a five-unit of an ordinary Splitdorf coil for the purpose on a four-cylinder car?

2—How to tell polarity of current in old-style Apple igniter dynamo, so as to charge storage battery?

3—What voltage should dynamo read?

4—Will it be a success to charge in this manner and ignite and light the car with storage battery?

5—Can I successfully construct an automatic switch on the dynamo from an ordinary bell magnet so that same will throw dynamo in and out to prevent bother of throwing dynamo on and off storage circuit?

6—Instruct me how to fit cylinder rings.

Atlantic City, N. J. J. W. TAYLOR.

—1—Splitdorf never made a five-unit induction coil. There is, however, a coil known as the four-cylinder synchronized coil made by the Splitdorf Co. in which a vibrator unit acts for the entire coil besides the regulation for induction units. The synchronized coil has been made by the Splitdorf Co. to do away with the individual vibrator adjustment. When this one vibrator is adjusted all the cylinders will fire in synchronism as far as the vibrator is concerned. This is no doubt the coil to which you refer in speaking of the five-unit type. The method of wiring up this coil is given in Fig. 2. The instrument consists of a vibrator which forms the fifth unit. The only duty of this unit is to operate for each coil in the series as the primary circuit is grounded by the commutator. The speed of this vibrator is very high, which is one of the recommending features of this system. The unit consists of a double-pole magnet applied under the base which actuates the vibrator spring and hammer. The magnet is excited by the current from the battery through the grounding of the commutator on the engine. The vibrator is fitted with a regular condenser for the suppression of the spark at the vibrator points, thereby avoiding burning these out rapidly. All the units of the coil are equipped with auxiliary condensers having a ground connection of their own to form a protective system to the commutator points on the motor.

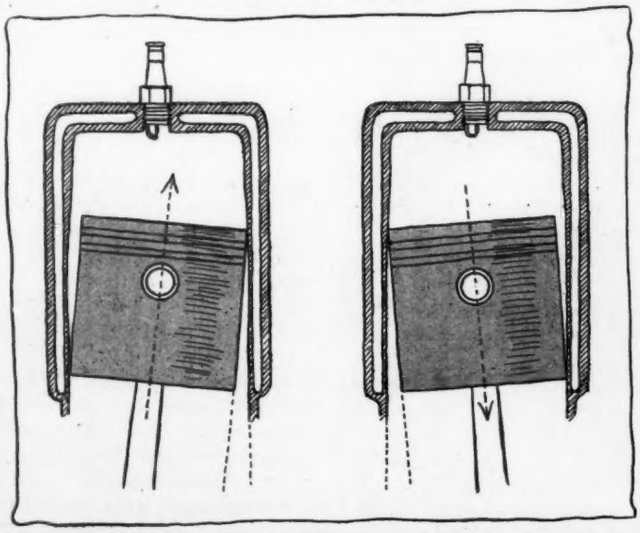


Fig. 1—Exaggerated sketch to show cause of piston slap. Piston rocks about wristpin

2—In the old-style Apple igniter dynamo the top of the pulley turns towards the plus pole. As the amperage of the dynamo only amounts to 2 it will charge the battery very slowly.

3—The voltage of the dynamo is about 7 or 8.

4—The system would operate with this dynamo, but it would be rather slow on account of the low output. It would be better to get one of the new dynamos for $27.50 and get an allowance for your old one. The allowance would probably amount to $5 or $6 and would thereby cut down the cost of the new one to a large extent. The new machine includes within it a governor and automatic switch.

5—Such a switch as you suggest would hardly work well enough to be depended upon. A new automatic switch which is positive in its action can be bought from the Apple Co. for $10. It would be better all around to install the modern system as stated under answer No. 4.

6—Piston rings are bought to size and are slipped down over the piston head into the grooves by placing thin strips of metal around the piston. About four of these strips of sheet metal a half inch wide will be sufficient to prevent the ring from slipping into any but the correct groove. After the rings have been placed in the piston the pistons can be pushed into the cylinder by compressing the ring by means of a cord wound around the lower part of the ring, leaving just sufficient space to be able to slip the upper edge of the ring into the cylinder.

## Repairing Radiator Tube Leak

Editor THE AUTOMOBILE:—I have an Elmore automobile, model 25, which has a McCord Mfg. Co. radiator on it, and one of the small radiator tubes about the center of the radiator has a split about an inch long in it. I see different kinds of radiator compounds advertised to repair such leaks, but hardly think such would make a permanent repair. So, if you can tell me of anything that would repair it without going to the expense of having new tubes put in, I would appreciate it very much.

Metz, W. Va. L. C. SHIELDS.

—To solder a leak in the tube of a radiator necessitates some delicate work unless you are somewhat familiar with the work. In fact, were you to take the radiator to your local plumber you would probably have to buy a new one after he got through with it. The amount of skill that is required depends largely upon the position of the leak. Assuming that it is in such a place that you can reach with a little care the method of procedure is as follows: Set the radiator in some position where you can work at it readily in a good light. Put a small piece of emery cloth on the end of a thin stick or rod and work down into the space between the tubes rubbing the metal along the leak until it becomes bright and clean. This must be done thoroughly if you wish the ultimate work to be a success. This will take some time if done right, and can be handled best if the radiator is tilted up in some such position as shown in Fig. 3. Immediately after the metal has been cleaned and be-

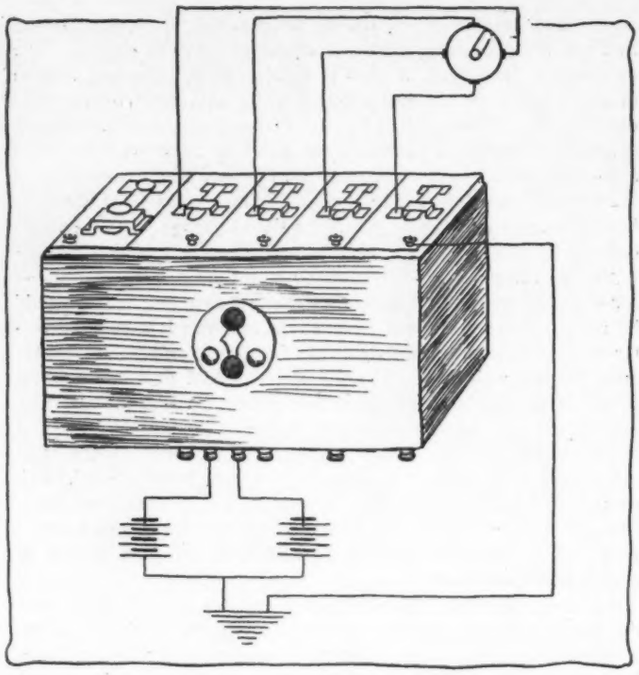


Fig. 2—Wiring diagram of Splitdorf coil with single vibrator

fore it has a chance to oxidize and become dull apply the flux, which should be zinc chloride. With a thin soldering bit heated to a cherry-red color, heat the metal to be soldered and which has been coated with the zinc chloride. While using the heated rod have another rod heating in the flame so that before the metal will have a chance to become cool the solder can be applied. The solder should be in the form of a narrow strip or else you will not be able to get it into the small aperture within which you have to work. To make the strip solder it is only necessary to heat a bar of solder and pour it into a vessel containing a small hole, as the solder is poured in it will leak through the hole in a fine stream and by running this stream along a metal surface a thin strip of solder will be produced. This should, of course, be ready before the work is commenced.

The solder is applied by means of the red-hot bit and is carefully moved along the surface of the metal which has been prepared by the flux. After the solder is applied the work should be cleaned up by the aid of a fine file.

The probabilities are that for the first two or three attempts you make at this you will have the pleasure of seeing the solder

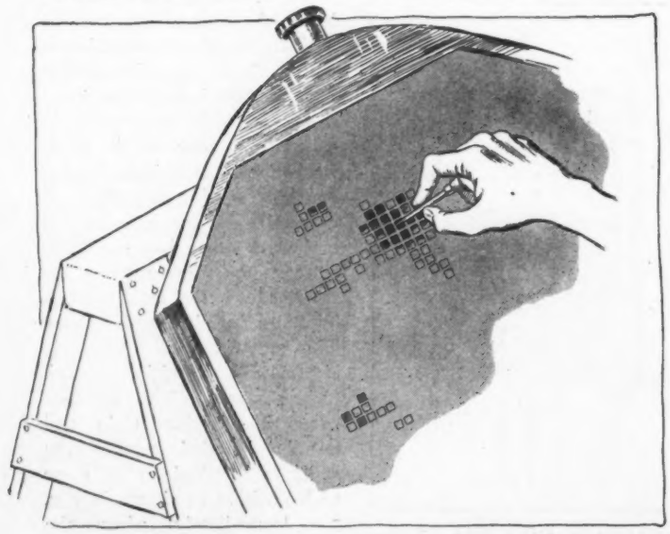


Fig. 3—Emery on the end of a fine rod will clean tube rupture

that you apply drop gently from the surface of the metal and leave the leak in very much the same state as it was at first, but with the use of considerable amount of patience you should be able to make a permanent job of it. The main part of the work is the preparation of the surface by means of the emery and flux. Some flux should remain on the surface when the solder is applied. The flux may be applied by the use of a fine paint brush. If you find that the leak is in such a place that it is absolutely inaccessible for this work, the best thing would be to send it at once to the factory and have the work done there, because this would be cheaper in the long run owing to the fact that it is very easy to spoil a large section of the radiator by means of a little clumsy workmanship. The solder to be used is the ordinary medium solder to be obtained in any plumber's shop. You can make it yourself by melting together one part of lead to two parts of tin.

## Car Weight Increases Air Pressure

Editor THE AUTOMOBILE:—A claims that a tire pumps up harder if the weight of the car is on the tire, B claims that there is no difference, as the air pressure is inside the tubes. Who is correct?

Bernardsville, N. J. C. B.

—This question has been argued for hours by chauffeurs and others and there appears to be no reason why it should not be clear. Perhaps you have stepped, at some time, on a partially-inflated rubber ball. The ball was round before you stepped upon it, but when you did this it flattened out. When you stood upon the ball the pressure within the ball became greater than before because the internal volume of the ball was decreased. In other words, the same amount of air occupied a smaller volume. The air was compressed and therefore its pressure increased.

Air is a perfect gas. Perfect gases follow Mariotte's law, which states that the volume of a gas diminishes at the same ratio that the pressure upon the gas is increased, or conversely. When the ball was stepped upon its internal volume was decreased. If there had been no air in the ball it would have been actually flattened out. As it was, however, the ball reached a point at which the pressure within was enough to hold it against further compression.

The same thing happens with a partially inflated tire. When the car is jacked up the tires are round and the internal volume of the tire is at a maximum. The inner tube is round. When the jacks are removed the inner tubes become elliptical in section and the internal volume is smaller. According to Mariotte's law the pressure in these tubes has increased in the same ratio that the volume has been decreased. It is harder to pump against a tire that has a pressure of 1 ounce more than another. Although the difference is minute, it is nevertheless there. A, is right.

## Wants Automobile Engineering Course

Editor THE AUTOMOBILE:—I should like to know if a boy of 18 years of age with 2 1-2 years in a high school of good standing can enter any automobile course or mechanical engineering course in any of our state universities.

Frankfort, Ind. L. C.

—The mechanical engineering course in a state university requires a standing equivalent to that of high school graduation. You may take college entrance examinations and if you pass with the required percentage you may enter. The probabilities are, however, that if you have just managed to pass the entrance examination and your foundation work is weak, you will be bothered during your entire university course by this insufficient groundwork. It would be wiser all around to complete your high school course before entering the university.

Automobile courses are just being considered by universities, and those which have adopted them use them as a sort of post-graduate course to their mechanical engineering studies or have a course which is very much like the ordinary automobile schools.

To make a proper study of automobile engineering you need the same training that you do before taking up mechanical engineering because the same principles are involved in each study and, in fact, automobile engineering requires a more extended course in thermodynamics. In order to study thermodynamics a knowledge of the calculus is necessary. To lead up to the calculus requires all the mathematics that you will get in your high school course.

## Derivation of S. A. E. Horsepower

Editor THE AUTOMOBILE:—Under the section Letters Answered and Discussed of your issue of April 10, 1913, the explanation of the derivation of the S. A. E. horsepower formula should be taken up differently.

First, the mean effective pressure assumed was 75 pounds per square inch. This should have been 90. No doubt, this was a typographical error as the final result $\frac{D^2N}{2.5}$ is correct.

The number of working strokes of a four-cycle and presumably a single-cylinder motor is $\frac{N}{2}$ in which $N$ = revolutions per minute. (We must bear in mind that there are two strokes per revolution.)

The speed of the piston in feet per minute is given as L N, in which L = stroke in feet; N = revolutions per minute. This should be: Piston speed in feet per minute is 2 L N. This, of course, is due to the fact that there are two strokes to a revolution.

I would like to submit a derivation of the S. A. E. formula which, I believe, will be much easier comprehended. Let us take the formula for indicated horsepower:

$$1 \text{ horsepower} = \frac{PLAn}{33{,}000}$$

P = mean effective explosion press in pounds per square inch
L = length of stroke in feet
A = area of piston in square inches
n = number of explosions per minute.

It is clear that this formula is good for motors of any number of cycles and cylinders. Let us now apply it to a four-cycle single motor.

Let R = number of revolutions per minute. Now we know that there will be one explosion for every two revolutions, therefore

$$n = \frac{R}{2}$$

Putting this value for n in the formula for 1 horsepower it will look like this:

$$1 \text{ horsepower} = \frac{PLAR}{2 \times 33{,}000}$$

Now let us convert this into the A. L. A. M. formula. Only a certain part of this power can be utilized.

Tests which the A. L. A. M. made showed this to be .75.

The formula then becomes

$$\text{A. L. A. M. horsepower} = \frac{.75\ PLAR}{2 \times 33{,}000}$$

A. L. A. M. tests showed that motors gave their maximum power at a piston speed of 1,000 feet per minute.

Piston speed in feet per minute = 2 L R.

Then, piston speed in feet per minute divided by 2 = L R.

If the piston speed is 1,000 feet per minute we get

$$\frac{1{,}000}{2} = 500 = L\,R.$$

For every revolution the piston travels the length of its stroke twice, therefore the 2 in the above.

Now we can write the formula

$$\text{A. L. A. M. horsepower} = \frac{.75\ PA\ 500}{2 \times 33{,}000}$$

Further tests of the A. L. A. M. showed that the average mean effective pressure of the motor was 90 pounds per square inch.

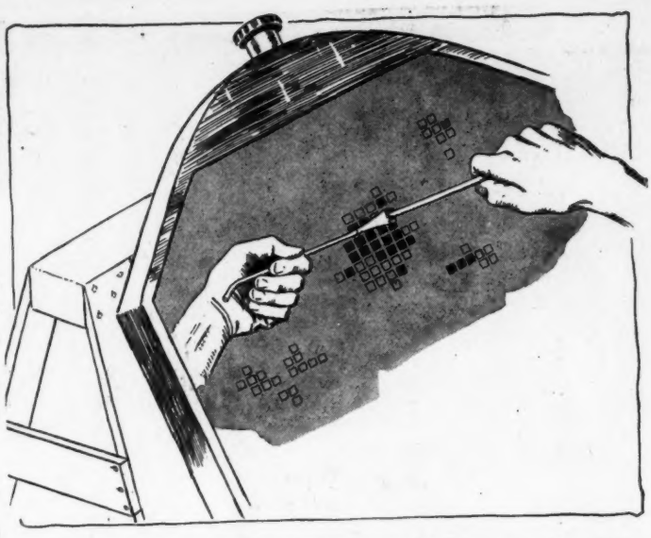


Fig. 4—String solder is used for repairing the radiator leak

This was adopted as the average mean effective pressure.

Then the formula becomes

$$\text{A. L. A. M. horsepower} = \frac{.75 \times 90 \times 500\,A}{2 \times 33{,}000}$$

If D = bore of cylinder in inches
$A = D^2 \times .7854$

This gives us

$$\text{A. L. A. M. horsepower} = \frac{.75 \times 90 \times 500 \times .7854 \times D^2}{2 \times 33{,}000}$$

Working this out gives us

$$\text{A. L. A. M. horsepower} = \frac{D^2}{2.49}$$

or in round numbers

$$\text{A. L. A. M. horsepower} = \frac{D^2N}{2.5}$$

This is the A. L. A. M. rating for a single cylinder. To get the A. L. A. M. horsepower for a motor of any number of cylinders you have simply to multiply by the number. Let N be the number of cylinders, then for any number of cylinders the

$$\text{A. L. A. M. horsepower} = \frac{D^2N}{2.5}$$

This explanation, I believe, is much easier followed out than one at which the conclusions are jumped at, even though the reasoning were right.

Detroit, Mich. FERDINAND JEHLE.

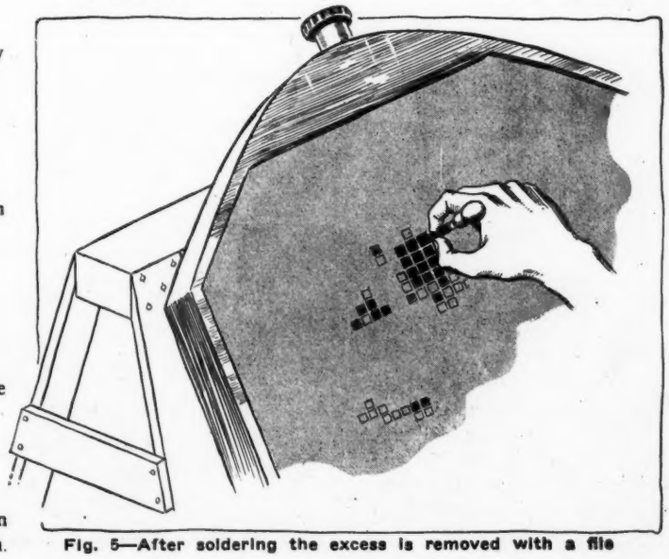


Fig. 5—After soldering the excess is removed with a file

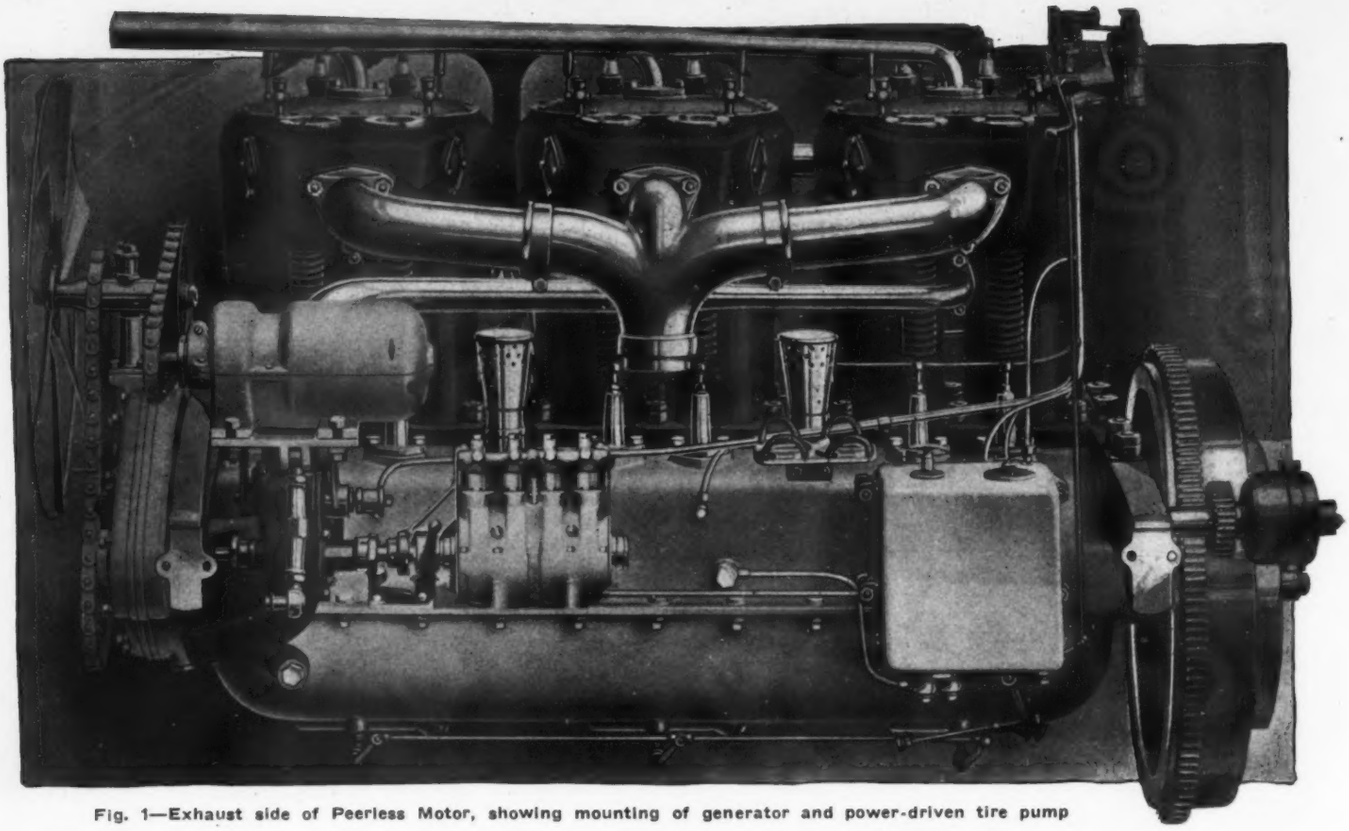


Fig. 1—Exhaust side of Peerless Motor, showing mounting of generator and power-driven tire pump

# Peerless Continues the Three Sixes

THREE models of Peerless cars will comprise the line of this company for the coming season. These are all sixes and are known as the 38-Six, 48-Six, and 60-Six. They are all identical in principle and construction, merely varying in the weights and sizes of the parts. The most important changes have been made in the direction of improving the riding qualities of the car and the changes made in this direction have resulted in a lower center of gravity. The gasoline tank has been placed under the rear of the body and is slung between the two side members of the frame while the tirs are now carried on a rack at the rear of the car instead of at the side on the running board. The springs have been made thinner by decreasing the thickness of the leaves and the front and rear axles are now fitted with shock absorber. The upholstery of the rear seat has been increased in thickness to 10 inches which insures increased comfort for the passengers.

The equipment of the car has been made more complete. It includes a speedometer in combination with a clock, a combination bulb and electric horn, an electric starting and lighting system, and the same type of power driven tire pump as used last year.

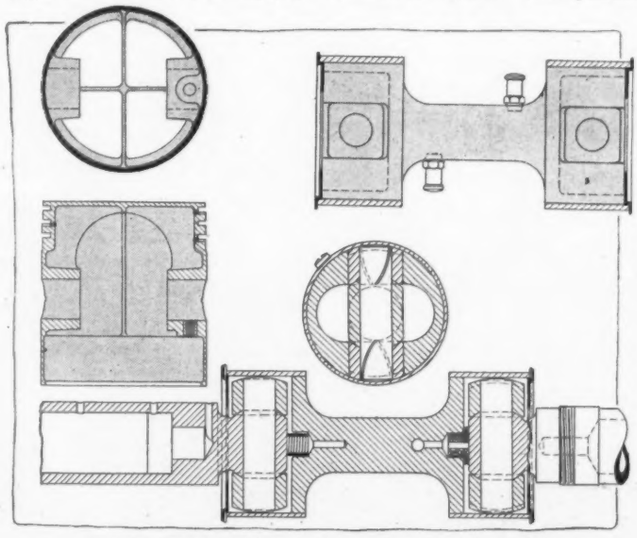


Fig. 2—Sectional views of new piston and universal

The motor sizes of the three new car models are as follows:

38-Six, bore 4 inches, stroke 5.5 inches.
48-Six, bore 4.5 inches, stroke 6 inches.
60-Six, bore 5 inches, stroke 7 inches.

The new pistons are different than the pistons used in the past. There are now three piston rings used instead of four. All three of these rings are located at the top of the piston. A cross section of the piston is given in Fig. 2 and also a plan view. It will be noticed that a very strong system of cross bracing is employed to stiffen the walls of the piston which have been made somewhat lighter. The cylinders are T-head cast in pairs.

Crankshafts are drop forgings tested for both static and running balance. The material is of chrome metal steel. Seven main bearings are used and they are all carried in the upper half of the crankcase. No shimming is used in the main bearings these being all scraped in by hand. All the bearing surfaces are ground and all the bushings have bronze backs lined with babbit.

The valves are of nickel steel and are operated by an eight-bearing camshaft. The camshaft, magneto and water pump shaft are all driven through spiral gears of semi-steel running in oil. The crankcase is contained in two horizontal sections and is made

of a special aluminum alloy.

The gasoline feed is by pressure from a copper tank suspended at the rear of the frame. This tank is a new departure for the Peerless company and is illustrated in detail in Fig. 4. As will be seen it is substantially braced by angle-iron cross members. A two-way gasoline valve connects either main supply 5-gallon reserve or shut off. The tank has a 22-gallon capacity and is supplied with an automatic gauge. The pressure is automatically supplied by a reciprocating pump on the engine and the air line contains a relief valve to limit the pressure in the tank. About 2 pounds is generally carried. There is a dirt trap in the gasoline line. The Peerless carbureter remains unchanged.

Ignition is by the Bosch Dual system as in the former models. When the magneto is not in use the current is suplied by the storage battery of the starting and lighting system which is kept charged by the dynamo.

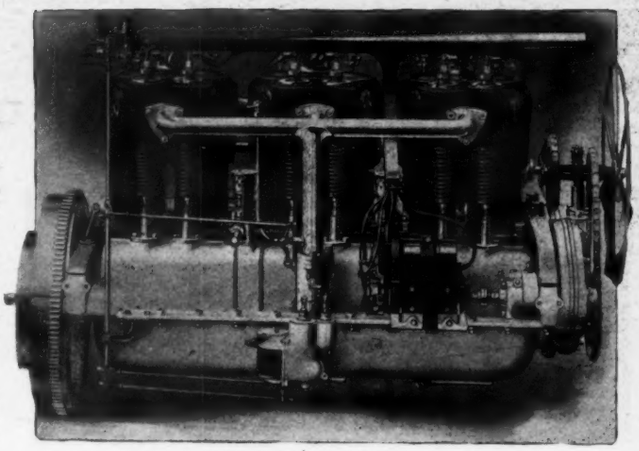


Fig. 3—Intake side of motor with magneto mounting

The Peerless type of expanding band clutch operating through a worm and screw is maintained. The frictional surface is composed of chrome leather with round cork inserts forming about 33 per cent. of the frictional surface. In the new model the action of the clutch has been somewhat improved by the introduction of a double swivel joint in the shifter fork support. The power is transmitted through a four-speed gearset which has been improved by the addition of a universal in place of the flexible coupling formerly used between the gearset and clutch. This new universal is illustrated in Fig. 2.

Another improved part of the car is the muffler. This has perforated baffle plates and an interior that may be removed for cleaning. It is placed lengthwise on the left side of the chassis instead of transversely at the rear as on all previous Peerless models. The spring suspension has been improved on all three models by using thinner leaves of high quality.

# Detecting Resistance—Saving Fuel

(*Continued from page 979*)

car is up to the standard of easy running or not, if, indeed, his gasoline bills have not already given him this information.

The question of grade can be solved by it instantly to the satisfaction of any doubtful ones.

Fitted to a neat bracket, so placed on the dash as to be easily read by the driver, one has always ready a sure detector of hard running.

An enterprising owner interested in engineering research can plot the torque curve of his motor by taking acceleration readings at different speeds and with varying gear combinations.

Perhaps the future car owner may require the torque curve of the motor to be produced by the makers, and before purchasing ask to make the accelerometer tests to verify it.

The instrument is not expensive ($52.50) and it is not difficult to use. Why then should it not be more widely used?

Partly perhaps because it is made in England and is not especially well known in this country.

(*Concluded*)

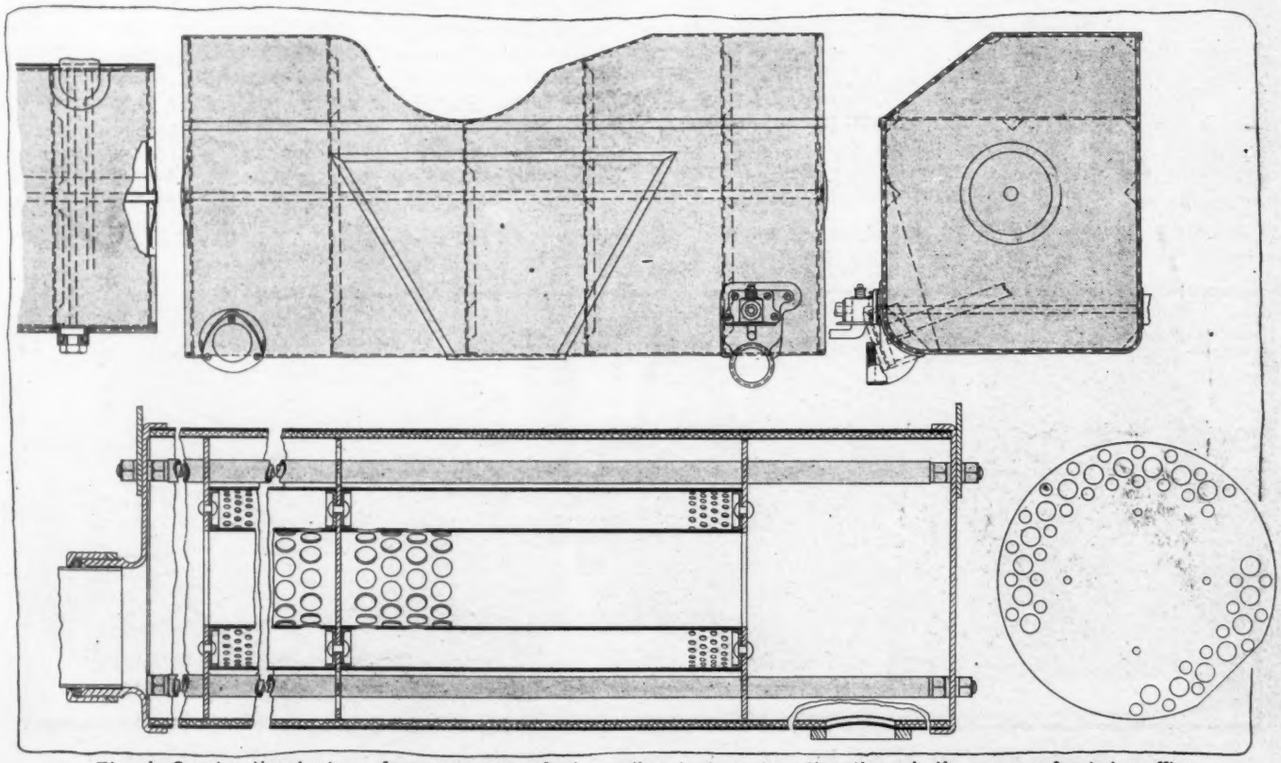
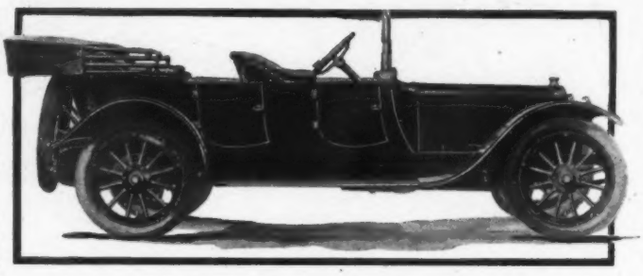


Fig. 4—Constructional view of new pressure feed gasoline tank and section through the new perforated muffler

# Chandler Six of Light Construction

THE new Chandler is strictly in line with the policy of the time in constructing light six-cylinder cars. Weighing less than 3,000 pounds and having a motor which develops 35 horsepower, the car is distinctive even in that field.



New Chandler light six, which weighs under 3,000 pounds

The motor has its cylinders cast in three blocks of two. The bore is 3.375 inches and the stroke is 5 inches. This gives an A. L. A. M. rating of 27.3 horsepower and a stroke-bore ratio of 1.33. Ignition is by Bosch high-tension magneto and starting is by the 6-volt Westinghouse system.

Coventry silent chains are used for driving the magneto, pump shaft and camshaft. The arrangement of the magneto, generator, cranking motor and pump may be noted from the illustrations of the motor at the foot of this page. The water pump and magneto are operated from the same shaft on the left side of the motor, while the generator and cranking motor form independent units and are located on the right side. The cranking motor in this installation carries a gear wheel on the end of the armature shaft. This gear meshes with the gears in the flywheel. The generator is driven from the timing gear set and is located at the front of the motor on the right side.

The lubrication system is a combination of the force feed and splash. Oil is forced from the crankcase oil reservoir to each of the main crankshaft bearings. From this point the oil overflows into a series of splash troughs located beneath the crank throws. The splash takes place in the customary manner. All the oil leads are contained within the crankcase. There are no exterior oil pipes.

The clutch is of the multiple-disk type with the alternate plates lined with Raybestos. The clutch and gearset form a unit with the motor and an aluminum housing, which is a continuation of the crankcase, encloses both the clutch and the three-speed selective sliding gearset. The gearshift lever and the brake lever are both connected to the gearset housing, giving center control.

The driveshaft has two universal joints and terminates in a ball-bearing rear axle of the floating type. The differential is of the bevel type and is also mounted on ball bearings. No torque strains are taken by the springs, these being absorbed by a triangular member of pressed steel.

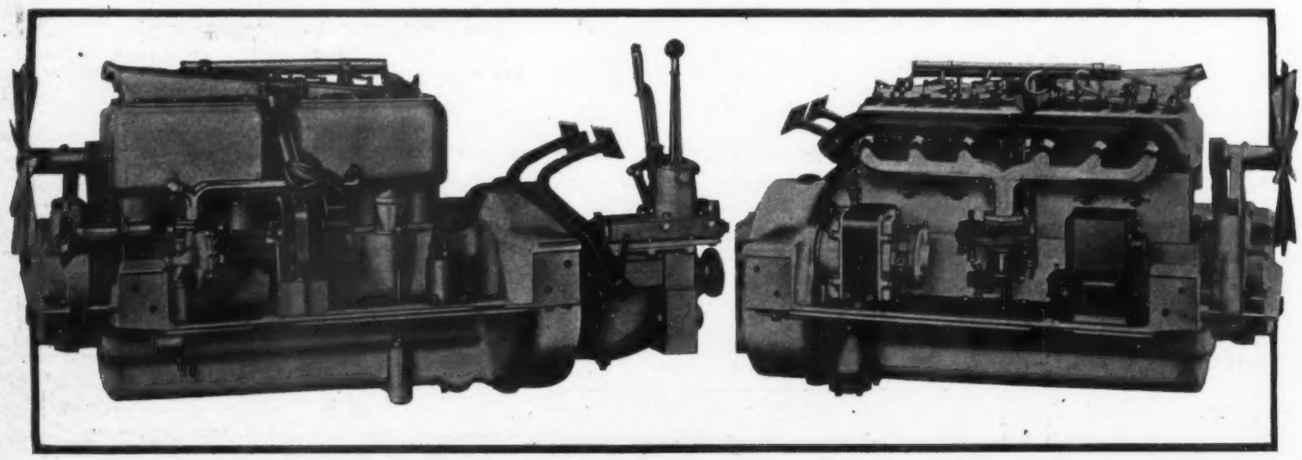
The channel side members of the frame are toed-in in front to decrease the turning radius of the car. This works out to 37 feet which is low for a car of 120 inches wheelbase.

The gasoline system consists of a 20-gallon tank swung between the members of the frame at the rear of the car. The gasoline is fed to the carbureter by pressure secured from a small reciprocating pump. The pressure maintained is in the neighborhood of 2 pounds. An air gauge is located on the dash to tell the pressure in the gasoline tank at any time. The makers claim a mileage of 13 to the gallon for this car.

The steering gear is a worm and sector. The column extends straight through the sloping footboard and terminates at the worm and gear housing. The column is raked back at a racy angle to coincide with the low driving seat given by the straight-line construction. The body side line is raised just slightly above the line of the hood, giving a pleasing appearance.

Throughout the entire construction of the car modern practice has been followed. An example of this is in the windshield, which is built directly into the cowl and does not require the long brace rods which are necessary in many types. This gives an air of simplicity to the body and does away with some of the lines that would cross the straight-line construction and destroy the simple and clean appearance that straight-line body work is supposed to give. The dash equipment is carried on a cowl board and the body line is kept smooth by mounting the lamps within the dash instead of allowing them to project.

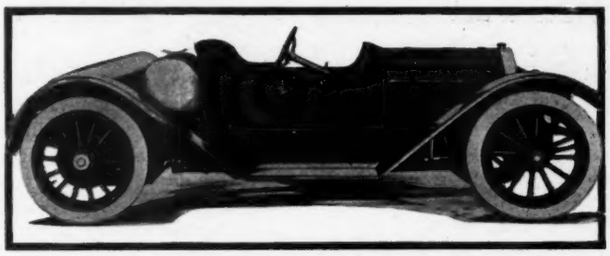
Complete equipment is furnished with the car. The accessories are stowed in a neat manner, leaving the streamline touring body lines unbroken at the sides. The extra tire is carried on the spare demountable rim at the rear of the car and the electric horn is mounted firmly on the motor itself, beneath the hood. The sound is projected through the radiator. The fenders are long and flat with a quick arch over the 34 by 4-inch wheels. Jiffy curtains, robe rail, speedometer, illuminated cowl dash, 12-inch Turkish upholstery and a full tool equipment fit the car for immediate use on the road in any weather.



The Chandler motor has its cylinders cast in two blocks of three and develops 35 horsepower on the block

# Multiplex—A New Car with Racy Lines

A NEW concern which was made known to the automobile world by the recent sealed bonnet endurance run of the Automobile Club of Philadelphia has brought out a car known as the Multiplex. It is made by the Multiplex Manufacturing Co., of Berwick, Pa. The car is made in touring and roadster bodies on the same chassis.



Multiplex roadster manufactured by new Pennsylvania concern

The motor is a four-cylinder Waukesha having a bore of 5 inches and a stroke of 6 inches. The A. L. A. M. rating of this motor is 40 horsepower. The makers' rating is 50. The cylinders are of the L-head type with inclosed valves.

Modern practice has been followed in the motor arrangement and the latest features for silence have been included. The crankshaft is suspended from the upper half of the crankcase the lower half being a separate casting and used for an oil reservoir. The gears are of the skew type and the valve action is reached by the removal of a cover plate.

Lubrication system employed is a combination force feed and splash. A gear pump driven off the camshaft lifts the oil from the crankcase reservoir and forces it to the three main bearings supplying these with copious lubrication. After leaving the main bearings the oil runs into the splash troughs which are located beneath each crank throw. Scoops are placed on the connecting-rod caps which throw the oil into the cylinders and also take care of the lubrication of the wristpins. A separate lead runs from the gear pump to the timing gearcase, causing the spiral gears to operate in a constant oil bath. The oil drains back to the crankcase after overflowing from the troughs and since the oil supplied is constantly in excess of the demands of the lubricating system, there is a continuous circulation maintained throughout the lubricating system.

Ignition is by Bosch dual system with a single set of sparkplugs. The systems are independent of each other except for the plugs. The carbureter is a Stromberg and draws its air supply from a heater surrounding the exhaust pipe.

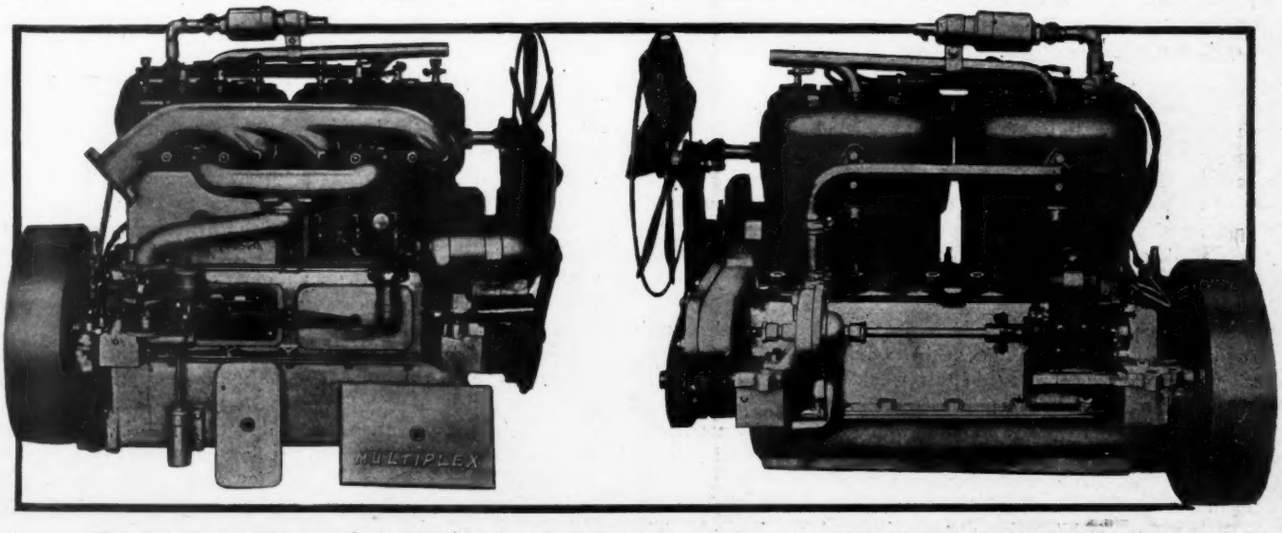
The Rushmore electric lighting and starting system is used on the car. This is a three-unit system, operating at 6 volts. The Rushmore generator has been on the market for some time and is of the iron-clad bi-pole type. The noteworthy feature of the Rushmore system is the regulation of the current by the utilization of a peculiar property of iron wire of greatly increasing its resistance when heated. The resistance of the wire is practically constant up to a certain point allowing the current in amperes to be proportional to the voltage applied. At a certain point, however, the wire reaches a dull red heat and at this point the resistance increases enormously, a very large voltage being required to force another ampere through the line.

The clutch is of the dry-plate multiple-disk type with alternate disks faced with asbestos material. The power is transmitted by a four-speed Warner selective gearset having the levers placed in the center to permit access from the right side of the car. Right steering is used, however, with center control. The fourth gear is higher than direct while the third gear is direct drive.

The steering gear consists of a worm and complete gear, the gear wheel being mounted on a square shaft which renders it possible to remove the wheel and give it a quarter turn when wear begins to appear.

Both the roadster and touring car bodies are swung long and in connection with the long wheelbase, 134 inches, and large wheels, a very racy appearance is given. The rear tires of the touring car are 39 by 5 inches and the front wheels of the touring and all the wheels of the roadster and race-abouts are 38 by 4.5. Firestone demountable rims are used all around. The tread is 56 inches and the floorspace of the tonneau is 45 inches wide.

The body is of steel panels on wood and iron framing, extra tonneau seats being supplied on the touring model which fold up very compactly and fit in floor sockets. They can be lifted out if desired to leave the floor clear. A refinement not always found on touring cars is the use of the step light which lights automatically when the door is opened. Another convenience is a light fastened in the folding top with a flexible cable leading to it and a push switch in the tonneau controlling it.




The four-cylinder Waukesha motor used in the Multiplex car has a bore of 5 inches and a stroke of 6 inches

# Making Motor Spirit

## Standard Oil Manager Outlines Process—Two Refineries Now Supplying Trade with New Fuel

WHEN, on the advent of motor spirit, came the statement that it would be sold at practically 3 cents per gallon less than gasoline, many were skeptical, feeling that the news was too good to be true, and naturally felt that even if the information were correct as to price there must be something wrong with the quality. To clear up this point it may as well be stated at the outset that the information as to price is correct, and with the exception of a slight odor, and the fact that the color is not quite water white, there need be no misgivings as to the quality either.

Gasoline is made, as everyone knows, by distilling the crude oil and taking off the lighter products. Other products then are made by further distillation, until finally there is a residue left that heretofore has been marketed only for fuel purposes at a price in competition with coal. For a great many years the chemists have known that this residue, or fuel oil, contained a large amount of material similar in composition to gasoline, but of a much higher boiling point. Notwithstanding the vast amount of experimental work that has been done, the problem of converting high boiling-point products into low boiling-point products by a practical method baffled every effort.

It is true that the necessity for a greater production of gasoline has become imperative only within the past year. Prior to that the refineries were able by the ordinary methods to produce enough gasoline to meet all requirements, but with the constant increase in the number of gasoline engines and the growth of the automobile industry, coupled with the decrease in the production of crude oil, an acute condition has been brought about within the last year. Necessity is ever the mother of invention; with the urgent necessity of an increased yield of a fuel for internal-combustion engines came a solution of the vexing problem, and the discovery of the process by which motor spirit is made.

### Total Fuel Production Doubled

As stated above, motor spirit is made from what was formerly known as fuel oil. It is extracted by the process of pressure distillation. Under this process it is possible to secure about as many gallons of motor spirit from a given amount of crude run as now are obtained of gasoline. Thus the total production of fuel suitable for gasoline engines can be practically doubled. Of course, this takes time. The process requires an extremely expensive plant installation—several times as expensive as is necessary in the ordinary refining process.

The operation likewise is expensive, but as rapidly as the stills can be built they are being erected at the huge refineries at Whiting, Ind., and Alton, Ill., owned by the Standard Oil Company of Indiana.

It will take several years to reach a point where a maximum amount of production can be secured, but the progress that has been made and is being made in the erection of these stills seems to give assurance that the supply of fuel will keep pace with the demand.

Motor spirit could be refined further, deodorized and a product could be obtained therefrom that would be identical in every way with gasoline, but to do this would bring up the cost of the product to the present price of gasoline. This would accomplish no good purpose. The odor, whilst pungent, is not necessarily disagreeable; it is simply a distinctive odor that is noticeable only when handling the liquid. The exhaust from an engine is not as offensive as is the exhaust from gasoline. You can ride in an automobile using motor spirit and not detect it. The color is of but little moment. We have learned to expect gasoline to be water white. The fact that the new fuel is slightly yellow has no bearing on its efficiency for power purposes, any more than if it were green or blue. There are other disadvantages in further refining this product.

There are certain inherent properties in motor spirit that are desirable for power purposes that would be taken out in refining, principally the low boiling points which make the starting of the car easy, for it is a fact that in cold weather a car can be started easier with this fuel than with gasoline. There is also more power in it than there is in gasoline, and further refining would destroy this advantage, so that there is everything to be lost and nothing gained in seeking a product that would look a little prettier and smell a little sweeter. As is the case with gasoline, it is desirable to use a chamois filter for filling to avoid the presence of moisture.

It is not necessary to use a different carbureter, but it will be found best to make a slight adjustment of the carbureter, either by reducing the amount of fuel or increasing the amount of air admitted to the carbureter.

Provision for storing motor spirit is being made through the entire section in which the Standard Oil Co. of Indiana operates. This in itself is a huge problem, but every effort is being made to supply the trade as rapidly as possible. The trade can now be supplied, even in the most remote sections by making shipments in iron barrels from distributing points. Of course, this will make some little reduction in the saving where local freight has to be paid, but there is still sufficient saving to warrant the consumer in using motor spirit.—P. C. CRENSHAW, general manager sales department, Standard Oil Co. of Indiana.

## English Fuel Situation More Acute

LONDON, ENGLAND, April 24—The fuel situation is growing more acute every week in this country. There is a strong feeling here that a combine controls the supply of motor fuels in England. It is a rather significant fact that almost simultaneously with the publication in America of facts concerning the new fuel, Motor Spirit, that the Shell interests here announced that they would in future furnish two grades of fuel. They always have supplied a heavy spirit named Crown which was not used by private car owners to any great extent, but by buses and cabs. Then they announced Shell I and Shell II, taking the opportunity to put Shell I up 4 cents a gallon, making it 43, and Shell II at 39. The Anglo-American people followed exactly 1 week afterwards taking the same course and putting up the price.

Motorists on this side feel very strongly that they are in the grip of a trust and that there will be no relief until there is a strong and determined competition up against them.

Our imports of motor fuel are rising enormously. During the 3 months ending March 31, we imported no fewer than 23,171,471 gallons, as against 14,903,951 gallons for the period last year.

There are campaigns on here for home-produced fuel, and the joint committee representing two of our institutions, the Royal Automobile Club, the Automobile Association, and our Trade Society is now investigating the whole question.

Every effort is being made at present to create a big demand for benzol, which is giving excellent results. It gives more miles to the gallon than gasoline, and has no deleterious effect on the engine. England is producing millions of gallons of benzol annually, but the irony of the situation is that the bulk of it is exported and used in France as a motor fuel. The home demand should be great enough to kep the stuff for use here, but even so, the supply is infinitesimal compared with the growing demand. The coke oven plants at the mines only produce 1½ to 2 gallons of benzol to each ton of coal treated, plus the various by-products, but investigations show that with a Del Monte system, this can be increased from 6 to 7 gallons per ton of ordinary coal, and to as high as 20 gallons per ton from channel coal. It is further claimed by this process that the residue after treatment is a thoroughly efficient smokeless fuel.


## Acetylene Tank Makers Protest Against Undue Emphasis Placed on Electric Light Systems for Automobiles

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—Inasmuch as the columns of the automobile press seem to be constantly filled with matter which discusses the value of lighting systems for automobiles, and which dwells largely on the use of electricity as an illuminating agent, we should like very much to suggest a thought or two which possibly may have escaped your attention.

We acknowledge the novelty of electricity, its undoubted convenience while in working order and the unquestioned widespread demand.

The other side of electric lights seems to be ignored, probably on the theory that the weakness will be eliminated in time. The fact that only the highest class of electric equipment, carefully installed and expertly cared for, is competent to give satisfaction seems to be having little or no publicity. It is well known that the makers of medium-priced cars cannot afford, at present prices, to install the grade of electrical equipment which will hold up and give service under practical road conditions. The manufacturers themselves admit it, and yet thousands of these outfits are being hastily put on, and incorrectly put on, in order that automobile factories may advertise "electrically lighted and started." Literally thousands of these systems have been torn out by the purchasers of such cars and gas lighting substituted.

Gas lighting yields nothing to electricity in point of convenience, cost of installation, cost of up-keep and service, quality and character of light or dependability. As a plain matter of fact, gas lamps, electrically lit, are as convenient as electricity. With the gas automatically regulated to give the proper height of flame in all the lamps at all times, the user has only to turn on the gas at the dash, press a button and the lamps are lit. True, an automatic electric lighter for gas lamps will occasionally get out of order—probably not as often as electric lights get out of order. But there is this important difference: When you push the button and your gas lamps don't light you can use a match; when you push the button and your electric lights don't light—suppose you tell your readers what to do.

### Misinformation on Cost of Service

Perhaps the largest single amount of misinformation on this whole lighting subject is on the point of cost of service. The expression "Electric light costs nothing—the engine generates the light," is a common one in the news columns, in electric light advertisements and in the mouths and minds of automobile dealers and owners. Coupled with this statement one usually finds the sapient remark, "you save the money you used to pay for gas." This is perhaps the largest factor today in the sale and use of electric lights, even greater than the convenience of electric lights, and yet it is an absurd untruth. The average user of gas for lighting pays not to exceed $10 per year. Can you figure out for the benefit of your readers how they can use electric lights at the minimum cost of $10 per year? In computing this take into consideration something more than is usually considered, namely, the cost of electric-light globes. Go also into the cost of repairs on electric lighting systems, cost of gasoline used for current generation, the cost of new batteries to replace those ruined by amateur abuse, and many other phases of electric lighting troubles.

Does an electric light company create its current and maintain its equipment for nothing? Will any well-posted electrician contend that the maintenance of electric equipment, particularly when operated by someone who is not an electrician, costs nothing?

The unreliability of electric lights is proverbial—the whole trade knows it. The stories of people who have suddenly found themselves without light on a country road, without the slightest knowledge of how to effect a repair, are not uncommon. Even officials of automobile factories have been compelled to spend the night at some small town, 50 miles from home, because they were powerless to repair their electric lighting system, and because dealers are likewise unable to render this service. And yet some of these manufacturers who, in private conversation have no hesitancy in admitting the need of an auxiliary lighting system on any electrically lighted car, are even proceeding to omit the oil founts from their lamps, thereby compelling their customers to rely wholly on electric lights.

The reason for this is not hard to find. People know that their houses are electrically lighted with almost no trouble. They therefore rush to the conclusion that electric lighting of automobiles is equally simple and equally dependable. Then, spurred on by misstatements of certain manufacturers that "electric light costs nothing" and encouraged by the dealer who spreads this same erroneous message, either because he does not know better or because he has electrically lighted cars for sale, the prospective automobile buyer has no reason for believing that electric lights are anything but ideal in every way. Hence the demand.

### Influence of Unprincipled Dealers

Another angle of the situation is the eagerness of a great many automobile makers to take prompt advantage of the unthinking demand which a few of the automobile makers originally created by spectacular announcements of electrical features. The dealer, instead of frankly telling his customers the disadvantages as well as the advantages of electric lights, and winning their gratitude for letting them see both sides of the question, realizes that he might make sales more easily if he could hand the public what they ask for regardless of its merits and so presses the factory for electric lighting equipment. The factory yields to this pressure, when it becomes sufficient, and thereupon promptly rushes into print with the announcement "electric lights."

Some dealers have already paid an excessive penalty for their part in this peculiar sort of sales logic by being compelled to perform gratis considerable expensive labor on lighting systems which they recommended and sold as "absolutely reliable."

That the reaction has commenced and will increase admits of no doubt, but the remarkable part of the situation is that the trade press itself, which should be the most reliable guide to public opinion, is reticently tagging along in the wake of the procession instead of attempting to lead it.

The gas lighting industry is showing today the largest per cent. of increase in its entire history. The only thing that could possibly change the situation, with any permanence, would be the perfection of an electric lighting system, cheap enough to be accessible to the maker of medium-priced cars and reliable enough to give satisfaction. That such a combination will ever come to pass defies imagination.

All the foregoing has been said with a view to encourage a calm, unprejudiced discussion of the lighting problem and in the hope that you may ultimately present the whole subject, uncolored by the imagination, unbiased even by the hope of future perfection of any system, and undaunted by any consideration of what people will say.—S. M. COOLEY, Prest-O-Lite Co.

# Test E.C.B. Carbureter on Many Fuels

## New Device Has Interconnected Throttle and Jet—External Adjustment of Fuel Level Provided

A CARBURETER which it is claimed will give correct fuel mixture at all running speeds, thus making for considerable fuel economy, has been developed by the Detroit Carbureter Co., and carries the trade name E.C.B.

The E.C.B. carbureter, a sectional view of which is shown in Fig. 1, possesses a number of unique features and on account of its peculiar design it really is equivalent to a small carbureter at low speed, and as the demand increases due to the greater engine speed the greater opening of the throttle and its interconnected fuel needle valve and air valve causes it to become virtually equivalent to a larger instrument.

The carbureter is of the concentric float type, the float surrounding the mixing tube and regulating the flow of fuel from the supply tank through a needle valve in the usual way.

Referring to the figure, the float is shown at F. The mounting of this float is one of the patented features of the instrument. It is what is termed a gimballed arrangement and really amounts to a universal connection to the arm $F_1$, allowing the float to remain stationary in any position. This is, no matter what the position of the engine on which the carbureter is placed and not actually upset, the float will maintain a constant level of fuel at the spray nozzle N. The primary air intake is at the bottom of the carbureter, allowing the air to pass vertically upwards around the nozzle where it mixes with the fuel. The auxiliary air enters at A and combines with the mixture at B, the whole passing on to the manifold through the diffusing screen at the outlet O.

The carbureter has no automatic features whatever, all variable quantities except primary air intake being controlled by their interconnection with the throttle. The throttle control lever is shown at T. This clamps the cylindrical throttle valve V, which has openings in its opposite sides. When these openings register with the passages O and A, air is admitted through A and fuel allowed to escape through O in proportion to the amount of register. The manifold opening in the throttle valve V has a certain lead on the air opening so that for slow running and for priming, the auxiliary air inlet is entirely closed.

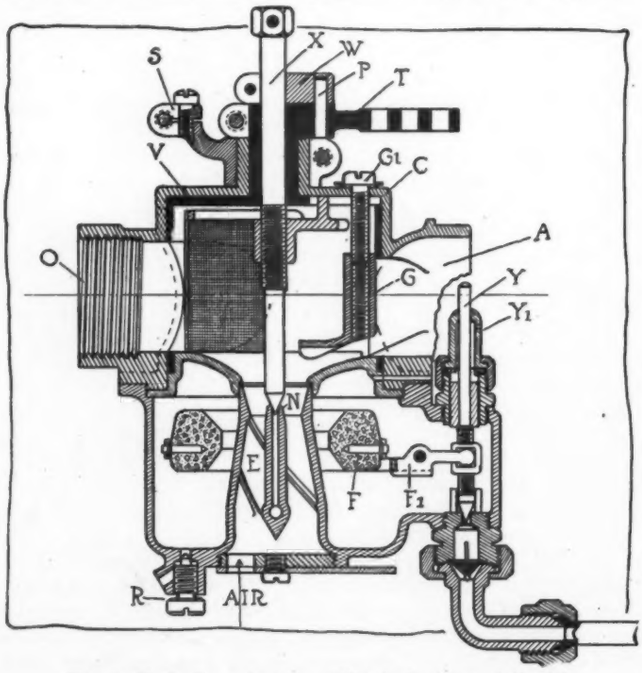



Fig. 1—E. C. B. carbureter with sleeve type of throttle

Referring to the figure, it will be seen that the needle X is screwed into a part of the carbureter casing. Through its clamp W and the pin P it is also fastened to the throttle lever T so that when the latter is turned it also raises or lowers needle from its seat.

The stop S is provided to prevent the opening of the throttle beyond a certain point. Thus when T is turned it opens the throttle, the auxiliary air and the needle valve all at the same time. The relation of these various openings must, of course, be adjusted after the carbureter is installed, so as to furnish the best results with a given engine.

It will perhaps be observed that without any apportioning feature, the amount of air admitted through the auxiliary intake would be in direct relation to the throttle opening through O. To take care of the greater proportionate amount of auxiliary air necessary with the increased engine speeds, an adjustable gate G is provided in the air intake passage. A clearer view of this gate is shown in Fig. 2. The lower edge of this gate G is inclined. Thus the more the valve V is opened the greater the proportion of air, since the valve opens from the left. The gate G may be raised or lowered in its guides through the adjusting screw $G_1$, allowing for the correct proportioning of the auxiliary air.

### Adjustment of Fuel Level

There are several special minor features of the carbureter which are of note. For instance, the adjustment of the level of the fuel in the float chamber may be very simply and correctly made for 1-64-inch increments. The upper end Y of the inlet valve is flattened on two sides, while the lower portion is threaded to fit the float controlling nut to which the float lever $F_1$ is connected. The needle guide $Y_1$ is broached at its upper end to fit the flattened part of Y, while at its lower end $Y_1$ is provided with two lugs or keys which fit in slots in the carbureter bowl. The thread of the needle is of such a pitch that when the guide $Y_1$ is turned so that these lugs fit the second set of slots beyond any given position they have either raised or lowered the fuel level by 1-64 inch. The clamping nut around the guide $Y_1$ prevents $Y_1$ from turning until the nut has been unscrewed sufficiently to allow the lugs to clear their slots so that accidental alteration cannot take place.

Another feature is the provision made so that the upper and lower halves of the carbureter may be placed in six different positions relative to each other. That is, the holes for the connecting screws in the lower half allow the register of the upper holes in six combinations. This permits the location of the carbureter on either side of the motor and allows for the accommodation of any position of the manifold and of the gasoline connection.

The venturi tube E is provided with spiral inner flanges to assist in the directing of the air rapidly to the nozzle. Another good feature is the placing of a drain plug at R.

The E.C.B. carbureter has been tested rather strenuously of late and is said to have come through with flying colors. In fact, the tests show that with a fixed adjustment it has worked satisfactorily on gasoline, mixtures of gasoline and kerosene, kerosene and lubricating oil, alcohol alone, and alcohol and water. A test of the carbureter was recently made by the Superior Motor Co., Detroit, with one of its stock two-cylinder, two-cycle motors, 3 1-2-inch bore and 4 1-2-inch stroke. A non-stop run lasting for 96 hours was made, the engine driving an 8-kilowatt generator and delivering approximately 9 brake horsepower at the flywheel.

The fuel used in this test was 50 per cent. gasoline .740 specific

gravity and 50 per cent. kerosene with specific gravity of .807.

For the 1st 24 hrs. 1,344,770 revolutions were made averaging 934 R.P.M.
For the 2d 24 hrs. 2,292,430 revolutions were made averaging 900 R.P.M.
For the 3d 24 hrs. 1,355,170 revolutions were made averaging 927 R.P.M.
For the 4th 24 hrs. 1,291,580 revolutions were made averaging 900 R.P.M.

The above variations were caused by moving the position of the throttle.

After this run the cylinders and all parts in general were examined. The pistons were free from carbon.

The engine was then re-erected for further tests on different fuels and different grades of the different fuels. Kerosene .807 specific gravity, or 44 degrees Beaumé, was next tried and worked as satisfactorily as the mixture of half kerosene and half gasoline combined. The following mixtures of kerosene and lubricating oil were next used:

| | S. G. | Beaumé |
|---|---|---|
| 7 parts of kerosene to 1 part of lubricating oil..... | .815 | 42.5 |
| 13 parts of kerosene to 3 parts of lubricating oil..... | .820 | 41 |
| 3 parts of kerosene to 1 part of lubricating oil..... | .825 | 40.5 |

The above mixtures held the load as steadily as the mixture of half gasoline and half kerosene did. With the last-mentioned heavy mixtures the exhaust was very smoky and would undoubtedly have fouled the engine in time, but with all of the previous tests as well as the following the exhaust was odorless, showing proper consumption of fuel.

A run with denatured alcohol purchased at a local drug store at 60 cents per gallon followed. The specific gravity of same was .835, or 38.5 Beaumé. This fuel was easily handled by the carbureter and engine and instantly showed an increase of power over the other fuels. It held the electrical load as steadily as any other fuel. The next test made was purely out of curiosity and for experiment:

| | |
|---|---|
| Alcohol 90 per cent., water 10 per cent., specific gravity..... | .850 |
| Alcohol 85 per cent., water 15 per cent., specific gravity..... | .860 |
| Alcohol 80 per cent., water 20 per cent., specific gravity..... | .975 |
| Alcohol 75 per cent., water 25 per cent., specific gravity..... | .890 |
| Alcohol 70 per cent., water 30 per cent., specific gravity..... | .905 |
| Alcohol 65 per cent., water 35 per cent., specific gravity..... | .920 |
| Alcohol 60 per cent., water 40 per cent., specific gravity..... | .935 |
| Alcohol 50 per cent., water 50 per cent., specific gravity..... | .960 |

After all of the above tests, a continuous run of 10 hours was made on pure kerosene, after which the cylinders were again removed for examination. The piston heads and all other parts were found to be as clean as when previously examined. The carbureter adjustment was the same throughout the entire tests and experiments. During the above tests no heat whatever was supplied to the carbureter either in the shape of hot water or hot air, the carbureter being made without hot-water jackets. The water used for cooling entered the cylinders cold just as it was pumped from the city supply or under the same working conditions that would occur with a marine engine. The only adjustments made were when the different viscosities of the various fuels demanded, it is said.

## Fisher 8-Ampere Generator

With the coming of electric lighting for automobiles, makers of electric apparatus have all striven for utmost efficiency and simplicity of generating units, so that they will be impervious to the shocks and jars to which motor vehicles are subjected.

One of the makers which claims to meet such conditions as those imposed by the automobile is the Fisher Electrical Works, Detroit, Mich., which has brought out the lighting generator shown in Fig. 3. This unit is of the inverted "U" type, which permits the minimum distance between the center of the armature shaft and the base of the generator. In the machine shown, this distance is 1.75 inches, including the non-magnetic baseplate. The generator is designed to be driven at crankshaft speed and comes up to its full rated voltage at about 300 revolutions per minute. It is so designed that the current produced does not exceed 8 amperes at any speed. The machine weighs 24.5 pounds.

The pole pieces and the fields are constructed of drop-forged steel, while the armature shaft, which is carried on ball bearings, is also of steel ground to size. The armature is of the drum wound type, the slots being partially closed by the overhanging tops of the segments. The field coils are wound in the usual way and the commutator is constructed of hard drawn copper segments with mica insulation.

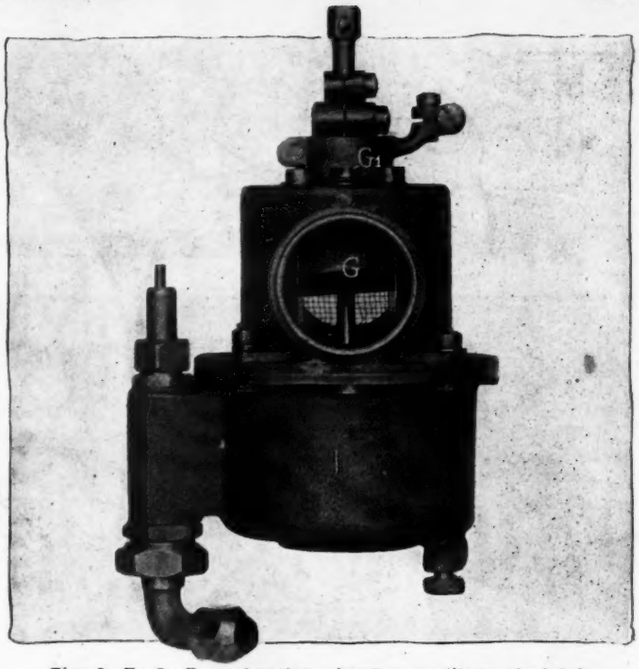



Fig. 2—E. C. B. carbureter, showing auxiliary air intake

The cut-in switch is mounted directly above the commutator casing, as shown at A, Fig. 3. The function of this device is to close the platinum iridium points at its base, when the generated energy reaches 7 volts, thus sending it to the storage battery. When the generating speed is too low to furnish the minimum voltage, the cut-in automatically disconnects the generator from the battery by opening the contact points. Thus, regulation is obtained automatically and there are no hand-operated switches used with the apparatus, with the exception of that for controlling the current to the various lamps.

The full potential is delivered at about 300 revolutions per minute and at about 400 revolutions per minute it is sending current to the battery at the rate of about 1 ampere. At a speed of 900 revolutions per minute it is delivering 6 amperes, coming up to its maximum of about 8 amperes at about 2,000 revolutions per minute. It is claimed that it is more desirable for a generator not to deliver over 8 amperes at any speed, thus charging the battery continuously at a moderate rate, than it is to race the generator at high speed, flooding the battery with successive charges for short periods; then operating at others without sending any current to the storage battery.

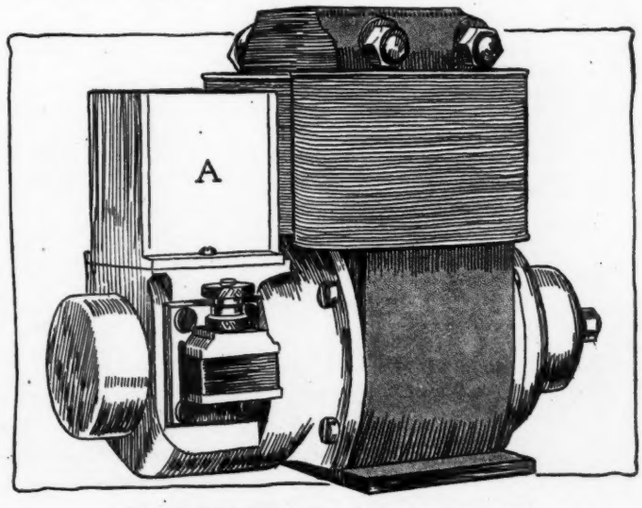



Fig. 3—External view of Fisher generator

# Factory Miscellany

Bank of drills and reamers which performs four separate operations on motor castings in one of the plants of the Studebaker Corp.

QUANTITY production means to a large extent keeping things moving. The machine shown in the accompanying illustration helps to do this in the Studebaker plant. The bank of drills and reamers is a special machine which performs four separate and distinct boring and reaming operations on the motor castings. The first operation is the boring of the holes for the bolts which fasten the cylinder block to the crankcase. The second operation is the boring of the push rod guide holes. The third operation is concentric with the second and is the boring for the valve stem guide. The fourth operation is really two in one and consists of reaming both the valve stem guide holes and the push roll guide holes with a two-step reaming tool.

**CHANDLER'S New Plant**—The Chandler Motor Car Co., Cleveland, O., is making rapid progress in the erection of the new steel and concrete plant near St. Clair avenue. The factory will have more than 50,000 square feet of floor space. The site which has been acquired consists of 6 acres. It is expected to have the factory completed by June 1 at the latest.

**Huselton Motor Company Working**—The Huselton Motor Co., Butler, Pa., recently organized, will commence work in the near future on the manufacture of motor trucks.

**Leases Prest-O-Lite Plant**—The Miami Cycle & Mfg. Co., motorcycle manufacturers of Middletown, O., has leased half of the old plant of the Prest-O-Lite Co., in East South street in Indianapolis, Ind.

**To Manufacture Electrics**—Volney S. Beardsley, president and manager of the California Automobile Co., Los Angeles, Cal., states that plans have been completed to manufacture electric cars on the Coast with a factory located in that city.

**Hewitt Rubber's Factory**—The Hewitt Rubber Co., Buffalo, N. Y., has filed plans in Buffalo for the construction of a new three-story brick factory at 240 Kensington avenue, to cost $175,000. Work will be started on the new building within the next 3 weeks.

**Moves Offices to Factory**—The E. B. Van Wagner Mfg. Co., Syracuse, N. Y., has moved its general offices to the factory at Fayettesville, N. Y. Extensive improvements have been made to the factory buildings, increasing office and manufacturing facilities.

**New Lord Baltimore Buildings**—It is stated that J. H. Powers, Gaither Bldg., Baltimore, Md., has plans in preparation for a group of buildings to be erected for the Lord Baltimore Motor Co., that city. The buildings are to be of steel and concrete. Details are not yet available.

**Erects New Deaco Plant**—The Detroit Electric Appliance Co., manufacturer of the Deaco electric lighting and starting system, is building a new plant on East Grand boulevard, Detroit. The new structure will be three stories high, of brick and concrete construction, and will cover 25,000 square feet.

**New Detroit Factory**—The latest recruit in Detroit, Mich., automobile manufacturing army is the Detroit Electric Appliance Co., maker of the Deaco apparatus for lighting, ignition and cranking. The new plant is being erected on East Boulevard and has a floor space of 25,000 square feet. It is to be of brick and concrete and three stories high.

**Wallis Tractor Rents Factory**—The Wallis Tractor Co., an $800,000 corporation formed in Milwaukee, Wis., will begin the manufacture of traction engines on a large scale in Cleveland, O., and has rented the factory buildings on East Seventy-second street near Clair avenue, formerly occupied by the Royal automobile company. H. M. Wallis, Sr., and H. M. Wallis, Jr., are the main stockholders in the concern.

**Tracy Moves Testing Plant**—Joseph Tracy has again moved his testing plant and laboratory, Rutherford, N. J., to larger quarters. At the new plant, six to eight motors may be tested simultaneously, and there are special facilities for making investigations on motor fuels. The equipment includes torsion, reaction, fan, electric, and hydraulic dynamometers, one of the latter having a maximum capacity of 500 horsepower.

**Bosch Makes Record**—The Bosch Magneto factory at Springfield, Mass., established a record for magneto shipments last month. There were shipped nearly 25,000 magnetos.

**Beaver Company's Plant**—The Beaver Automobile Co., Portland, Ore., recently incorporated with a capital of $150,000, will erect a plant in Vancouver, B. C., for the manufacture of automobiles.

**Ravenna Working on Plant**—The Ravenna Auto Truck Co., Ravenna, O., has started work on the erection of its proposed factory. It will be 50 by 150 feet. The company makes automobile trucks.

**Erects $100,000 Chicago Plant**—The W. J. Hughey & Son Co., Chicago, Ill., will erect a factory at Prairie avenue and Thirty-third street for the manufacture of automobile bodies. The estimated cost is $100,000.

**Pope's Production Increasing**—Production at the factory of the Pope Mfg. Co., Hartford, Conn., has been at a satisfactory rate and without interruptions such as have occurred in former years. To date the company has built approximately 1,100 automobiles as against 531 in the same period in 1912 season and 820 for all the 12 months to July 31 last.

**Davies-Bach to Add**—The Davies-Bach Mfg. Co., Cleveland, O., with a plant at Alliance, O., for the manufacture of automobile parts, has increased its capital stock from $300,000 to $600,000, in order to provide additional working capital. The company is about to place a contract for a large addition to its plant to be used for assembly purposes and a pickling department. Still further enlargement will be made in the summer, when the company will set about the construction of a sheet metal and enameling plant.

**Peerless Factory Pushed**—E. J. Kulas, general manager of sales for the Peerless Motor Car Co., Cleveland, O., has issued a bulletin to the company's dealers and branches throughout the country offering customers whose orders are on the books for delivery before July 1, $100 for delaying the delivery of the car till after that date if the delay amounts to 30 days and $200 if it amounts to 60 days. This unusual situation is due to the fact that the spring rush of orders is pushing the factory in an unprecedented manner in spite of the additional facilities provided at the plant.


New motor-testing plant of Joseph Tracy at Rutherford, N. J.

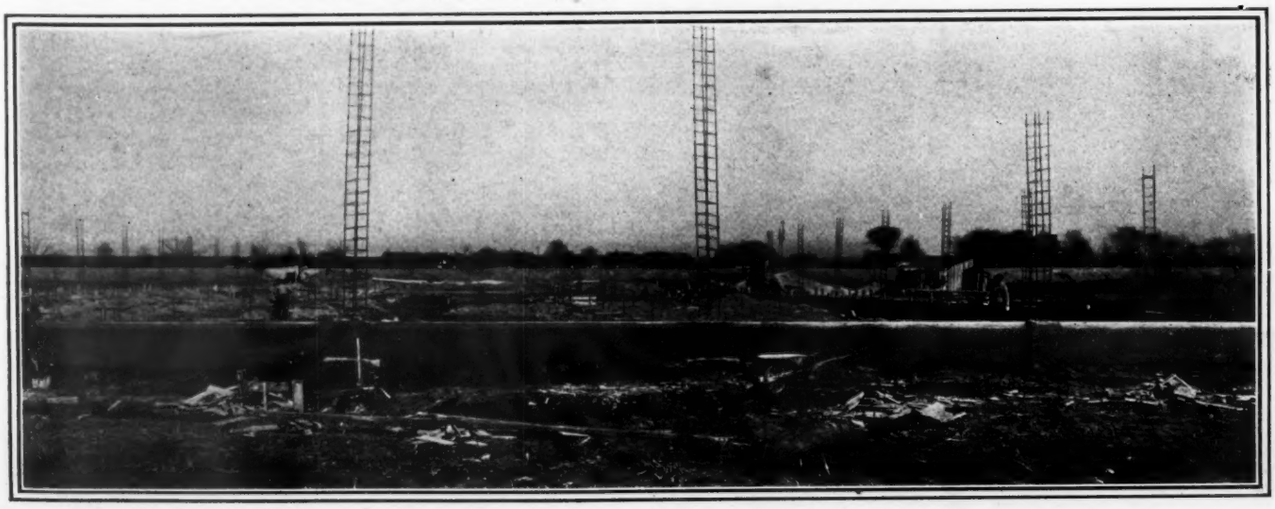
## The Automobile Calendar

### Shows, Conventions, Etc.

| | |
|---|---|
| May 20-21 | Boston, Mass., Convention of Electric Vehicle Makers. |
| May 20-23 | Baltimore, Md., Spring Meeting, American Society of Mechanical Engineering. |
| June 2-7 | Racine, Wis., "Made in Racine Exposition," J. I. Case Co.'s foundry. |
| June 5, 6, 7 | Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers. |
| October | Paris, France, Automobile Show, Grand Palais; 10 days. |
| November | London, Eng., Annual Automobile Exhibition, Olympia. |

### Race Meets, Runs, Hill Climbs, Etc.

| | |
|---|---|
| May 5-8 | Washington, D. C., Motor Truck Reliability, *Washington Post.* |
| May 14-15 | New York City, Start of 2-Day Hudson and Catskill Scenic Tour. |
| May 17 | Atlanta, Ga., Automobile and Accessory Assn. Annual Hill Climb. |
| May 29-30 | Chicago, Ill., Inter-Club Reliability to Indianapolis, Ind., Chicago Motor Club vs. Illinois Athletic Club. |
| May 30 | Indianapolis, Ind., 500-Mile Race, Speedway. |
| June 5 | New York City, Orphans' Day Picnic at Glen Island, Orphans' Automobile Day Assn. |
| June 7 | Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Automobile Clubs of Delaware County, Philadelphia and Germantown. |
| June 14 | Cincinnati, O., Hill Climb, Cincinnati Auto Dealers. |
| June 16, 17, 18 | Columbus, O., Reliability Contest, *Ohio State Journal.* |
| June 19 | Chicago, Ill., Algonquin Hill Climb, Chicago Motor Club. |
| June 25-28 | Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club. |
| July 1 | Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Assn. to the Pacific Coast. |
| July 1-16 | Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager. |
| July 4 | Taylor, Tex., Track Meeting, Taylor Auto Club. |
| July 4-5 | Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Assn. |
| July 5-6 | Tacoma, Wash., Road Race, Montemara Festa Automobile Committee. |
| July 8-16 | Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager. |
| July 11 | Twin City, Minn., National Reliability Tour, A. A. A. |
| July 27 | Grand Rapids, Mich., Tour, Grand Rapids Auto Club. |
| July 27-28 | Tacoma, Wash., Tacoma Road Races. |
| August 5 | Kansas City, Mo., Sociability and Endurance Run from Kansas City to Colorado Springs, Col., Kansas State Automobile Assn. |
| Aug. 29-30 | Elgin, Ill., Elgin Road Races, Elgin Road Race Assn. |
| Aug. 30-Sept. 6 | Chicago, Ill., Reliability Run, Chicago Motor Club. |
| Sept. 1 | Columbus, O., 200-Mile Track Race, Columbus Auto Club. |
| Sept. 9 | Corona, Cal., Track Race, Corona Auto Assn. |
| Oct. 4-11 | Chicago, Ill., Around Lake Michigan Run, Chicago Motor Co. |
| Nov. 24 | Savannah, Ga., Vanderbilt Cup Race, Motor Cups, Holding Company. |
| Nov. 27 | Savannah, Ga., Grand Prize Race, Automobile Club of America. |



Laying the foundations for the new steel and concrete plant of the Chandler Motor Car Co., Cleveland, O.

# The Week in the Industry

## Engineer — Dealer — Repairman — Garage

An Indian driver on one of the White trucks used in building an oil pipe line from the Midway fields in California to San Pedro

How the pipe lines were distributed along the road

WHITES BEAT 500 MULES—The Auto Delivery Co., San Francisco, Cal., recently undertook a hauling contract in building an oil pipe-line from the Midway oil fields in California to tidewater at San Pedro. Eighteen White motor trucks were used, supplanting 500 mules. A journey of 40 miles through desert sand and other hindrances had to be made. Before great progress could be made it became necessary to build bridges and put on full-blooded Indian drivers to stand the heat. The average time made by the trucks was about 8 miles an hour.

WILBUR ASSISTANT GENERAL MANAGER—L. R. Wilbur has been made assistant general manager of the Empire Automobile Co., Indianapolis, Ind.

GERAGHTY GENERAL MANAGER—F. D. Geraghty has been appointed general manager and president of of the Imperial Motor Tire Co., Washington, D. C., recently incorporated for $100,000. The principal offices will be at 1112 Connecticut Avenue.

TO HAVE ITS OWN BUILDING—The Grafton & Knight Mfg. Co., of Worcester, Mass., has decided to house its motor cars in a building of its own on Franklin street that will be 95 feet by 25 feet, one story in height and take care of a dozen cars.

WILL HANDLE ACCESSORIES—H. P. Thompson, formerly with the Houston, Tex., branch of the Goodrich Co., has accepted a position with the Houston Motor Car Co., Cadillac distributors. Mr. Thompson will have charge of the tire and accessory department.

WADE GENERAL PURCHASING AGENT—F. A. Wade, formerly purchasing agent of the Flanders Motor Co., has been made general purchasing agent of the Maxwell Motor Co., Inc., with headquarters at the executive offices, Woodward avenue and Warren, Detroit, Mich.

TIMES SQUARE COMPANY'S ADDITION—Immediate work will be started on the construction of two additional stories to the rear building of the Times Square Automobile Co., New York City, extending from 56th street to 55th street. When completed there will be over 100,000 square feet of floor space.

INTO NEW QUARTERS—The salesrooms formerly occupied by the R-C-H Co. at 911 Boylston street, Boston, Mass., have been secured by the Michigan Motor Car Co., that was further down town in showrooms that were not so attractive because of their being several feet up in the air. The R-C-H Co. retains a part of the floor space.

ACCESSORY CENTER IN INDIANAPOLIS—Agents for manufacturers of automobile accessories in Indianapolis, Ind., are considering the feasibility of establishing an accessory center for the purpose of decreasing overhead expense. In Indianapolis each agent would have supervision over the business of the company he represents.

WITH ABBOTT-DETROIT—A. L. Bennett has become sales manager for the Abbott-Detroit Co. in New York City.

ADDS VULCANIZING SHOP—The E. S. Youse Co., Reading, Pa., is adding a tire vulcanizing shop to its automobile establishment.

SECURE FISK TIRE AGENCY—Rudolf & West, automobile accessory dealers in Washington, D. C., have secured the Fisk tire agency.

PITCHER COLUMBUS BUGGY MANAGER—L. W. Pitcher has been made manager of the Columbus Buggy Co. branch at Minneapolis, Minn.

NEW FIRESTONE FRISCO HOME—The new home of the Firestone Rubber Co., San Francisco, Cal., was recently opened on upper Van Ness avenue.

PORTLAND ADDS TRUCK—Portland, Ore., has recently added another Federal truck to its string, this being the eighth truck in service of that city.

POLLOCK KISSELKAR MANAGER—The KisselKar sales and service building at Wabash and 26th street, Chicago, Ill., has been put in charge of P. J. Pollock.

GIBNEY'S BOSTON BRANCH—Manager Albert L. Greene of the Gibney Tire & Rubber Co. has opened his salesrooms at 245 Columbus avenue, Boston, Mass.

COLLARD NEW GOODYEAR MANAGER—C. E. Collard has been appointed manager of the motor truck department of the Goodyear Tire & Rubber Co., New York City.

LAND PURCHASED FOR AGENCY—Land was purchased recently for the new home of the Michigan Motor Sales Co., Los Angeles, Cal. It will be completed by July 1.

THORNTON MANAGER—J. M. Thornton has again returned to the Seattle, Wash., field, this time as manager of the McKenna-Marmon Co., selling the Interstate cars.

TAKES MCNAULL TIRE AGENCY—The Rogers Supply & Tire Co., Columbus, O., has taken the central Ohio agency for the McNaull electric tires, manufactured in Akron, O.

BASLE WITH SOWERS TRUCK—A. H. Sowers has secured the services of Charlie Basle, the racing driver, who will assume charge of the assembling plant of the Sowers Motor Truck Co., Boston, Mass.

TRADE CONGRESS IN GENEVA—The Syndicate of Swiss Motor and Cycle Manufacturers and Agents has invited the International Union of European Motor Car Builders to hold a congress in Geneva during 1914.

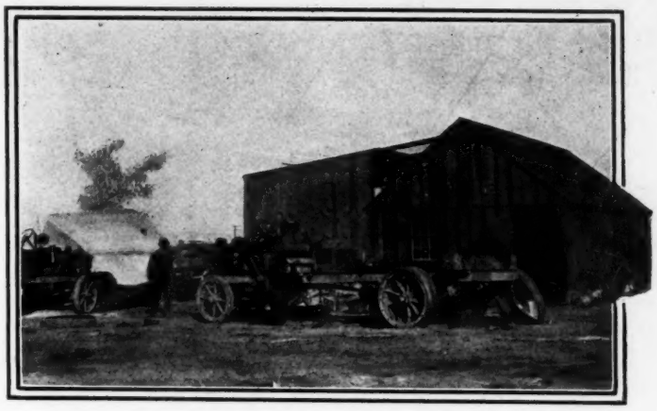
DE DION MOVES—The De Dion Bouton Selling Branch, New York City, announces the removal of its showroom to 1672 Broadway, northeast corner of 52d street. The garage and repair department is on 110 West 54th street

LOCOMOBILE TRUCKS FOR VANCOUVER—Two 5-ton Locomobile trucks have recently been purchased by the city of Vancouver, B. C. The cars will be used as street flushers and each will transport a tank carrying 12,000 gallons of water.

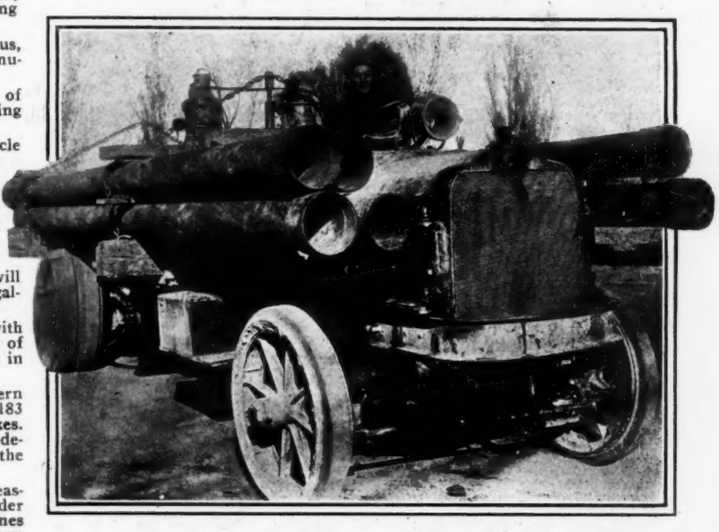
WILSON WITH MARATHON—F. E. Wilson has severed his connections with the Tone Car Corp., Indianapolis, Ind., and joined the sales organization of the Marathon Motor Works, Nashville, Tenn. His headquarters will be in Dallas, Tex.

NEW HARTFORD SALESROOM—Edward S. Clark, Paige-Detroit and Modern representative at Hartford, Conn., has acquired the whole salesroom at 183 Allyn street, one-half of it having been formerly occupied by T. E. Oakes. Richard C. Skinner, state representative of the Shawmut tire and tube department of the Hood Rubber Company, will conduct a tire branch at the same address. Alterations are now in progress.

DRAWBACK ON ANNULAR BEARINGS—A ruling has been made by the treasury department at Washington, D. C., that drawback shall be allowed under section 25 of the existing tariff act on motor cars and motor car engines manufactured by the Briggs-Detroiter Co., of Detroit, Mich., with the use of imported annular bearings. The allowance is not to exceed two imported annular bearings to each motor car or engine exported.



Rough-and-ready garage at Lancaster, Cal., for the trucks



How the pipes were carried, ready to drop at the roadside

Hauling sheet metal and supplies through the sand hills. Blankets, food and water were carried with every load

New model Peerless 38-six with touring body

# Automobile Incorporations

## AUTOMOBILES AND PARTS

BRITTON, OKLA.—Darling Automobile Mfg. Co.; capital, $25,000; to manufacture automobiles. Incorporators: C. P. Stealey, A. W. Hedge, H. O. Crum, G. R. Crawford, S. D. Shintaffer, D. L. Sellers, W. C. Settle, H. S. Emmerson, C. L. Stealey.

BROOKLYN, N. Y.—S. & K. Mfg. Co.; capital, $10,000; to manufacture and deal in motors, engines, etc. Incorporators: Harry Stander, F. J. Hill, Stephen Koefler.

BUFFALO, N. Y.—Seleck & Co.; capital, $40,000; to deal in automobiles. Incorporators: G. K. Selleck, M. L. Selleck, W. M. Selleck.

CHICAGO, ILL.—Falk Sales Co.; capital, $25,000; to deal in automobiles and accessories. Incorporators: L. W. Mack, W. J. Dixon, L. L. Falk.

GALVESTON, TEX.—American Motor Co.; capital, $2,000; to deal in automobiles. Incorporators: John Christensen, Johann Rasmussen, Geston Weigel.

MEMPHIS, TENN.—Michigan Motor Car Co. of Memphis; capital, $5,000; to deal in automobiles. Incorporators: R. Kupferschmidt, C. V. York, Irby Bennett, J. J. Carrigan, H. L. Combs.

MOLINE, ILL.—Borg & Beck Co.; capital, $80,000; to manufacture machinery and motors. Incorporators: O. W. Borg, M. Beck, G. W. Borg.

NEWARK, N. J.—Ingle Motors Co.; capital, $25,000; to manufacture motors, engines, etc. Incorporators: J. E. Ingle, Jr., C. L. Riess, C. M. Maurling.

NEW YORK CITY.—Still's Automobile & Accessories Co.; capital, $10,000; to deal in automobiles and accessories. Incorporators: G. M. Still, G. E. Still, J. H. Still.

NEW YORK CITY.—Tarrytown Motor Car Co.; capital, $250,000; to deal in automobiles. Incorporators: B. J. Knerr, A. M. Levy.

SACRED HEART, MINN.—Sacred Heart Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: J. H. Sagnes, P. Melsness, Torlief Arestad, W. A. Day, E. O. Dosseth.

SLAYTON, MINN.—Murray County Automobile Co.; capital, $10,000; to deal in automobiles. Incorporators: A. Peick, F. F. Young, O. L. Young, O. H. Harrington, LeRoy Triplet, W. E. Richardson, Oliver Duchene, Cornelius Casey, Charles Carlson.

SOUTH BOSTON, VA.—Auto Co.; capital, $15,000; to deal in automobiles. Incorporators: J. A. Mebane, Frank Mebane, W. W. Ballou.

UTICA, N. Y.—H. D. Grim Auto Co.; capital, $20,000; to deal in automobiles. Incorporators: C. W. Grim, Fred Crain.

## GARAGES AND ACCESSORIES

AKRON, O.—Diamond Rubber Co.; capital, $10,000; to deal in rubber and rubber goods of all kinds including automobile tires. Incorporators: A. H. Marks, O. C. Barber, Guy E. Norwood, A. B. Jones, N. S. Noble.

BROOKLYN, N. Y.—Self-Generating Motor Co.; capital, $250,000; to manufacture machines for generating steam, etc. Incorporators: O. G. Holzhausen, R. T. Maul, H. B. Wood.

BUFFALO, N. Y.—Fedders Mfg. Co.; capital, $400,000; to manufacture automobile accessories and supplies. Incorporators: T. Fedders, C. W. Fedders, J. M. Fedders.

CANTON, O.—Canton Tire Saver Co.; capital, $25,000; to manufacture a liquid preparation to be used in automobile tires to prevent and stop punctures and deal in other automobile and motorcycle accessories. Incorporators: J. A. Calhoun, H. H. Calhoun, A. H. Wilson, A. E. Gordon, W. E. Romy.

CHICAGO, ILL.—Costello Seat Co.; capital, $10,000; to manufacture automobile accessories. Incorporators: G. W. Costello, Deward J. Hennessy, W. R. Swissler.

CLEVELAND, O.—Punctureмend Co.; capital, $1,000; to manufacture and deal in articles to be used in connection with automobiles and any part thereof. Incorporators: H. C. Wharfield, M. A. Wharfield, T. L. Felber, Florence Cook, W. B. Wood.

CINCINNATI, O.—Heeb Auto Service Co.; capital, $10,000; to deal in automobile accessories. Incorporators: Charles Estep, J. E. Reese, J. E. Marget, W. W. Weaver, R. E. Anderson.

CINCINNATI, O.—Neeb Auto Service Co.; capital, $10,000; to carry on an automobile service. Incorporators: P. B. Davidson, H. C. Armstrong, J. Trumbull, Victor Heintz, C. M. Neeb.

CLEVELAND, O.—Auto Garage Co.; capital, $5,000; dealing and renting automobiles. Incorporators: J. M. Bachelder, W. M. Dilkes, B. Kilkes, G. W. Gunney, Horace Neff.

CLEVELAND, O.—Harris Carbureter Co.; capital, $15,000; to deal in carbureters and other automobile accessories, machinery and appliances. Incorporators: H. C. Cummins, F. B. Fishman, J. W. Camp, L. A. Black, Harry Pott.

HEMPSTEAD, N. Y.—James Street Garage; capital, $5,000; to carry on a garage business. Incorporators: T. A. McWhinney, F. W. Russell.

HARTFORD, CONN.—Automobile Insurance Co. of Hartford; capital, $300,000; to engage in automobile insurance. Incorporators: M. G. Bulkeley, M. B. Brainard, J. S. Rowe, C. H. Remington, H. R. Clough.

MONTREAL, QUE.—Montreal Autobus Co.; capital, $10,000,000; to carry on an automobile bus business. Incorporators: H. S. Holt, U. H. Dandurand, F. L. Wanklyn, D. McDonald, J. S. Norris, Tancrede Bienvenue, D. Lorne McGibbon, Paul Gailbert, J. E. Wilder.

NEW YORK CITY.—Gerleit Auto Spring Wheel Co.; capital, $200,000; to manufacture an automobile spring wheel. Incorporators: August Gerleit, Martin Vath, Henry Heil.

NEW YORK CITY.—National Spark Plug Co.; capital, $10,000; to deal in automobile supplies, etc. Incorporators: R. L. Cherburg, C. B. Bennett, Agnes Boselman.

NEW YORK CITY.—Universal Liquid Register Co.; capital, $25,000; to manufacture and deal in gasoline gauges, etc. Incorporators: A. D. Dickerson, C. F. Brown, H. M. Moorhead.

PAINESVILLE, O.—Vulcan Mfg. Co.; capital, $200,000; to manufacture automobile accessories.

PITTSFIELD, N. Y.—City Garage and Sales Co.; capital, $50,000; garage business. Incorporators: W. G. Venn, M. H. Ward, H. N. Stackpole.

RICHMOND HILL, MASS.—Richmond Hill Garage & Machine Co.; capital, $8,000; to manufacture machinery, etc. Incorporators: C. H. Ryan, A. F. Ryan, M. E. Tunon.

SYRACUSE, N. Y.—Bendring Mfg. Co.; capital, $50,000; to manufacture piston rings and other engine parts. Incorporators: H. C. Cowles, W. R. Walker, A. L. Jones.

SEDALIA, MO.—Shaffer Motor Co.; capital, $35,000; to manufacture and repair the Shaffer revolving valve internal combustion gas engine and motor machinery. Incorporators: F. K. Shaffer, J. H. Remington, C. S. Gray.

SPRINGFIELD, O.—National Jack & Mfg. Co.; capital, $6,000; to manufacture automobile accessories. Incorporators: G. Wallace, J. L. Glaze, C. Kraft.

SHERIDAN, IND.—Sheridan Motor Bus Co.; capital, $5,000; to operate a bus line from Sheridan to Noblesville. Incorporators: J. W. Ridge, Emma Ridge, Haley Hutchens.

WASHINGTON, D. C.—Imperial Motor Tire Co.; capital, $100,000; to deal in automobile tires.

## CHANGES OF NAME AND CAPITAL

CLEVELAND, O.—Davies-Bach Mfg. Co.; capital increase from $300,000 to $600,000.

CLEVELAND, O.—R. H. Allen Motor Sales Co.; change of name to the Velie-Paige Motor Car Co.

ELMWOOD PLACE, O.—Highland Body Co.; capital reduced from $50,000 to $5,000.

SANDUSKY, O.—Suspension Roller Bearings Co.; capital increase from $250,000 to $350,000.

RICHMOND, IND.—George W. Davis Carriage Co.; change of name to the Geo. W. Davis Motor Car Co.

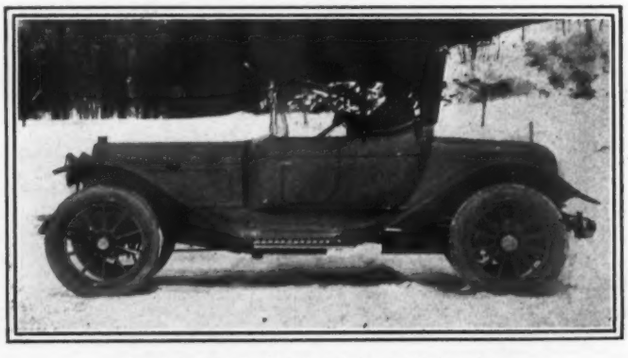
# New Agencies Established

## PLEASURE VEHICLES

| Place | Car | Agent |
|---|---|---|
| Alexandria, La. | Kissel Kar | Sloan Motor Co. |
| Barre, Vt. | Kissel Kar | Barre Kissel Kar Co. |
| Beresford, S. D. | Kissel Kar | Motor Inn. |
| Bridgeport, Conn. | Kissel Kar | Boulevard Garage. |
| Cadiz, O. | Mitchell | J. W. Robertson. |
| Cadiz, O. | Oldsmobile | J. W. Robertson. |
| Cadiz, O. | Overland | E. M. Long & Sons. |
| Cadiz, O. | Reo | George Sampson. |
| Cadiz, O. | Studebaker | J. W. Robertson. |
| Chadron, Neb. | Little | O. U. Linington. |
| Chadron, Neb. | Reo | O. U. Linington. |
| Chicago, Ill. | R-C-H | Centaur Motor Co |
| Claremont, N. H. | Kissel Kar | Earl F. Howe. |
| Cresco, Ia. | Franklin | McHugh & Lusson. |
| Dyersburg, Tenn. | Kissel Kar | J. S. Scott. |
| East Orange, N. J. | Kissel Kar | C. A. Dorer. |
| Eau Claire, Wis. | Kissel Kar | A. C. Jordan. |
| Edmonton, Alta. | Franklin | C. M. Jamieson. |
| Erie, N. Y. | R-C-H | Wood & Gammon. |
| Fort Worth, Tex. | Kissel Kar | Chandler & Hightower. |
| Grand Island, Neb. | Empire | Jarvis Bauder Auto Co. |
| Hemingford, Neb. | Little | H. O. Wildy. |
| Hemingford, Neb. | Reo | H. O. Wildy. |
| Jamaica, L. I. | Kissel Kar | Consolidated Gar. |
| Lake Charles, La. | Kissel Kar | Calcasieu Motor Co. |
| Lebanon, N. H. | Kissel Kar | Smith Auto Sales Co. |
| Lima, O. | Henderson | Auto Sales & Supply Co. |
| Los Angeles, Cal | Kissel Kar | Pacific Kissel Kar Branch. |
| Lynn, Mass. | Kissel Kar | Essex Automobile Co. |
| Marietta, O. | Hudson | W. W. Wood. |
| Merna, Neb. | Little | B. S. Wells. |
| Newark, N. J. | Kissel Kar | I. H. C. Motor Express Co. |
| Norfolk, Va. | Kissel Kar | Allen Motor Co. |
| Paterson, N. J. | Kissel Kar | Taximeter Auto Co. |
| Phoenix, Ariz. | Apperson | Southwestern Auto Co. |
| Phoenix, Ariz. | Buick | Southwestern Motor Co. |
| Phoenix, Ariz. | Hudson | Carr Auto Co. |
| Pittsfield, Mass. | Kissel Kar | S. W. Goodrich. |
| Phoenix, Ariz. | Pope-Hartford | W. D. Tremaine |
| Red Bank, N. J. | Kissel Kar | F. H. Van Dorn. |
| Rising Sun, O. | Franklin | E. F. Day. |
| San Francisco, Cal. | Kissel Kar | Pacific Kissel Kar Branch. |
| Sioux City, Ia. | Kissel Kar | H. E. Blum. |
| Syracuse, N. Y. | Hudson | H. E. Stowell. |
| Syracuse, N. Y. | Packard | H. E. Stowell. |
| Tempe, Ariz. | Ford | E. H. Spain. |
| Tucson, Ariz. | Hupmobile | Underhill & Campbell. |
| Uniontown, Pa. | Michigan | Craig Motor Car Co. |
| Uniontown, Pa. | Page | Craig Motor Car Co. |
| Warrensburg, Mo. | Kissel Kar | H. R. Ogleby. |
| Washington, D. C. | Norwalk | Edward Bready & Co. |
| Washington, D. C. | Regal | Probey Co. |
| Washington, D. C. | Selden | C. D. B. Motor Co. |
| Watertown, N. Y. | Chalmers | B. H. Treadwell. |
| White Salmon, Wash. | Kissel Kar | G. A Thomas |

## COMMERCIAL VEHICLES

| | | |
|---|---|---|
| Los Angeles, Cal. | Lauth-Juergens | Langford, Bacon & Myers. |
| New York City | Brown | Torney & Fargo. |
| Uniontown, Pa. | Reo | Craig Motor Car Co. |



Peerless new model 38-six roadster type

# Accessories for the Automobilist

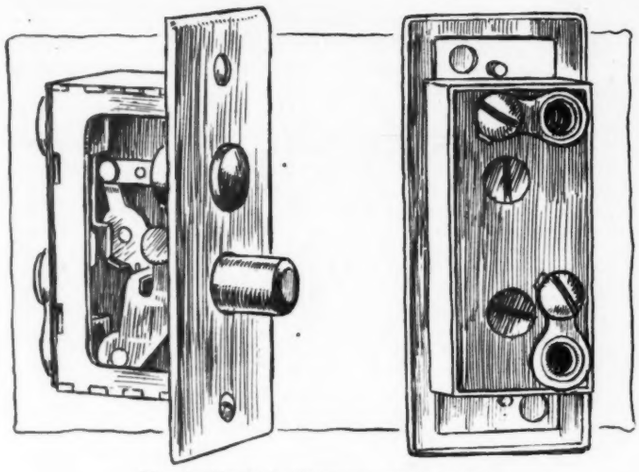


Fig. 1—Hart & Hegeman push switch

A PUSH SWITCH specially constructed for automobile lighting systems, is made by the Hart & Hegeman Mfg. Co., Hartford, Conn. This switch, Fig. 1, is constructed along the same lines as the ordinary house switch, and consists of two push-buttons which bear upon a pivoted lever, so that by depressing one the other button is raised above the plane of the metal face of the switch. The face of one button is finished in white and that of the other in black, and linked to the white button is a short lever which is raised or depressed by raising or depressing the button. If the latter is pressed in, the end of the short lever contacts with a plate inside the back of the switch. This plate is connected to one of the terminals on the back of the switch—which are seen in the illustration to the right—the other terminal is connected to the short lever.

## Benson Self-Adjusting Worm Drive

The worm drive, Fg. 2, which is made by the Benson Car Co., Chicago, Ill., is so constructed as to do away with the necessity of adjusting the relation between worm and gear so as to prevent localized wear of the operating members. This end is obtained by the relative arrangement of worm gear as here shown. The point X of the worm is the fulcrum on which the gear works, and being central the wear is equally distributed toward both sides A and B. In order to permit the upper worm, however, to move sideways relatively to the lower gear, the trunnion T on the flange F is used.

## Simple Ventilator for Coupe Bodies

A simple and neat ventilator for closed cars which would seem to be very practical is being made by Morrissey's Shop, Chicago, Ill. As shown in Fig. 3, it consists of a vertical pipe or neck B to which a horizontal top plate carrying a flange F is fastened. A cover C fits over the plate, which former is shaped with two holes, one cut into each end. On one of its longer sides, however, the cover does not reach down fully to the plate, but leaves a slot through which air enters if it is turned forward in the direction of the moving car. The device is installed at the roof of the body, the neck projecting into the coupé. As the car moves, the air entering through the slot is led down through B and forced into the interior of the body, supplying the passengers with fresh air.

## Fabric Tester for Interlock Liners

The Double-Fabric Tire Co., Auburn, Ind., tests the fabric used for its inner liners in a hydraulic machine, Fig. 4. The special laminated fabric used for the liners is made from high-grade Egyptian cotton, the threads of which are composed of three times the number ordinarily used, according to the manufacturer, and woven so that all of them are under even tension. The testing machine consists of a hydraulic press, which moves a hammer against the fabric, the blow amounting to 1,500 pounds per square inch. This is approximately the breaking strength of the fabric used for the inner liners.

## Liquid Tire Tonic

The Liquid Tire Tonic Co., Kansas City, Mo., is manufacturing a tire tonic to stop punctures. This company claims that it will not only cure punctures instantly, automatically and permanently, but will increase the life of the tire at least 30 per cent. It is a free-flowing liquid or semi-liquid sealing agent of cement, so that upon puncture in a tire the escaping air will force said agent or cement into the aperture or wound, thereby closing or healing the same, preventing the further escape of air confined therein. The liquid is employed as a self-healing agent designed to automatically close or heal a leak. This liquid is injected in the inner tube and by centrifugal force it is evenly distributed around the inner surface of the air-containing tube. It has the consistency of molasses and has the property of remaining fluid when exposed to the air contained in the tube, but will harden upon exposure in small quantities to the outer air. The basis of the tonic is a fiber and when a puncture occurs the suction of air through the hole instantly pulls the fibre into it, automatically plugging the puncture, and as the compound hardens in the hole a permanent cork is formed. This tonic is so made chemically that it has a preservative effect upon the rubber in the tire and prolongs its life. Automobile owners who treat their tires with this solution do not sacrifice any of the advantages of riding on air. Only about a quart of the tonic is needed for each tire. It is poured through the valve and requires only 6 per cent. of the space inside of an inflated tire, the remaining 94 per cent. being air. As soon as the wheel is in motion this fluid forms a thin coating over the walls of the inner tube.

## New Scott Side-Curtain Fixtures

The Star Storm Front Co., Troy, O., manufactures the ingenious side curtains which are illustrated in Fig. 5. These consist of celluloid panes secured to pressed sheet metal frames, the

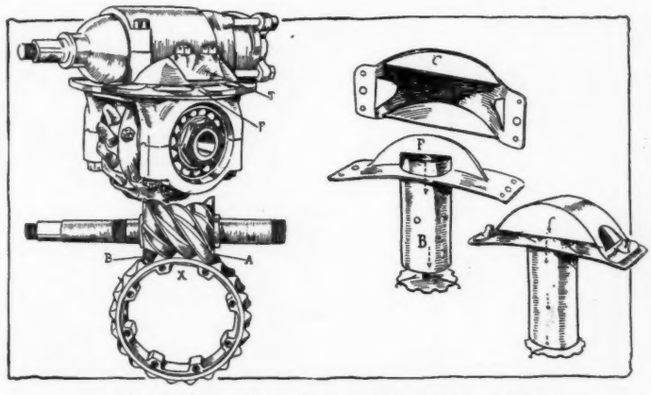



Fig. 2—Benson drive. Fig. 3—Morrissey ventilator

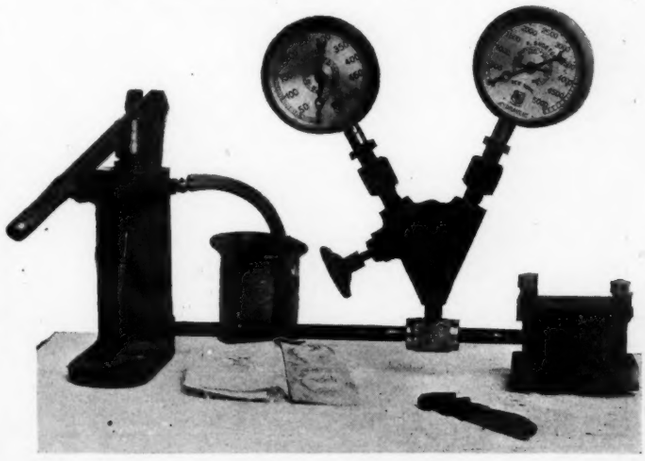


Fig. 4—Innerlock fabric tire strength tester

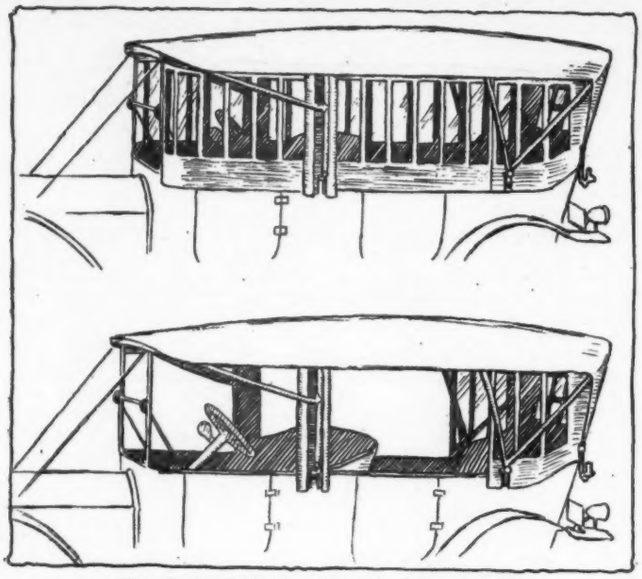


Fig. 5—New Scott automatic side curtains

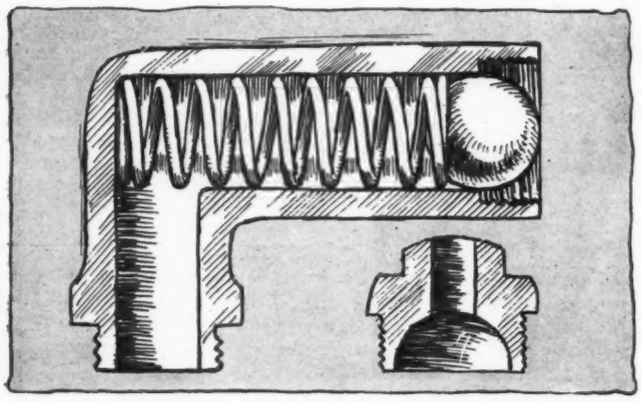


Fig. 6—Automatic gasoline saving device

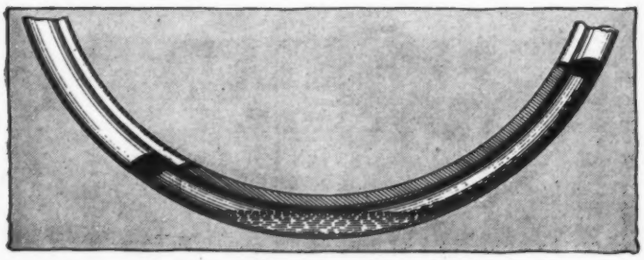


Fig. 7—Duryea self-healing inner tube

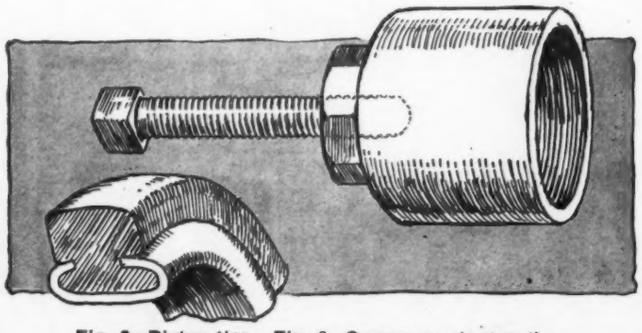


Fig. 8—Divine tire. Fig. 9—Grossman wheel puller

whole curtain being capable of rolling around a rod. How this property of the material used is utilized in the construction is seen by referring to the illustration. The curtain on each side consists really of three sections, front, middle and rear. The latter is permanently open, that is, visible, being mounted on the side edge of the rear of the top and to the rear upright of the top frame. The front and middle sections are secured at their relative rear and fore edges to rotatable rods or bars inclosed in a metal housing. These bars are held under spring tension somewhat similar to that applied to window-shade mechanisms. The free edges of front and middle sections are temporarily secured to the windshield frame and the front edge of the rear section. By this construction it is easy to open or close all or any of the six curtain sections promptly and with hardly an effort. The use of the materials above named warrant the longevity and strength of the device.

## Automatic Gasoline Saving Device

An auxiliary air intake device is being made by the Automatic Gasoline Saver Co., 1777 Broadway, New York City. This accessory is shown in Fig. 6. It consists of a brass angle pipe with polished surface, which screws into the intake pipe of the motor with the end shown as the lower in Fig. 6. The horizontal (in the illustration) shank of the pipe contains a coiled spring which presses against a ball fitted into the screw-threaded end of the pipe. Into this end fits also a plug threaded externally, the interior of which is shaped as a hollow sphere with a diametral outlet pipe through the surrounding plug metal. The plug is also made of brass. As it is screwed into the end of the pipe, it pressed the ball against the spring, the tension of the latter holding the former tight against the plug and closing the outlet opening tapped into the latter. .The operation of the device is automatic, as follows: If the motor is started and run at low speed, the saver is not influenced at all and all its parts remain in the same condition and relation as when the motor is at rest, being those described before. When, however, the motor is sped up by wide opening of the throttle, the motor developing more suction than can be satisfied by the air passing through the carbureter intake—which is of limited capacity—draws the air out of the pipe and the atmospheric pressure outside of the latter works upon the ball, pressing it against the spring, compressing the latter and opening an inlet for auxiliary air. The capacity of this inlet varies with the throttle opening, being maximum with the largest opening of the same. By screwing the plug in more or less, it takes a higher or lower speed to bring the instrument into action and to compress the spring.

## Grossman Wheel Puller for Fords

The Emil Grossman Co., 250 West Fifty-fourth Street, New York City, manufactures a wheel puller for Ford cars, Fig. 9. The device consists of a bobtail hubcap through which screws a bolt. To apply the device, the original hubcap is taken off the wheel, and the bobtail cap is screwed on in its place. After it is tightened on the end of the axle, the screw which is threaded through the center of the end plate of the cap is screwed in, thereby pressing upon the end of the axle and forcing the wheel off the axle of the car. The only tool required in the use of this device is an ordinary spanner or wrench for engaging the square head of the screw bolt.

## Divine All-Fabric Tire

The Divine Tire Co., Utica, N. Y., makes the tire shown in Fig. 8, which is composed entirely of cotton fabric, containing no rubber or binding material of any nature. The tire consists, in other words, of a number of canvas blocks, held together under the great rim pressure. The threads of the fabric are placed diagonally so that the wear comes on the thread ends. The coefficient of traction of this tire is claimed to be very high and it is said to be non-skidding. While it has not as much resiliency as rubber, it is stated by the manufacturer that the tire is very well capable of absorbing road shocks. One of the principal advantages of this tire is its long life. This is easily explained as due to the high pressure of the fabric in the rim, which evens up all inequalities of the tread after any objects picked up while traveling have been removed.

## J. H. Tonneau Shield

The J. H. Tonneau Shield Co., 229 West Forty-ninth Street, New York City, is manufacturing a small windshield which is designed to protect the passenger in a tonneau from the wind. The shield consists of a mahogany frame made in three sections and fitted with glass panes. The sections are joined with the main frame by means of brass joints. The two side sections may be folded over the central section and the latter may be turned from a vertical into a horizontal plane, in which position it may be used as a table. A waterproof curtain depends from the lower edge of the central section.